

SOUTH AUSTRALIA'S CLIMATE CHANGE STRATEGY 2015 – 2050

Towards a low carbon economy







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MESSAGE FROM THE PREMIER AND MINISTER

Climate change provides South Australia with one of the biggest economic opportunities of the 21st century. While global warming presents significant challenges for the state, taking ambitious and early action can position us to maximise this opportunity.

Being the first is about unlocking research and innovation, attracting investment, and creating jobs. This is the unequivocal advice of numerous experts including South Australia's Low Carbon Economy Experts Panel whose work has helped shape this new strategy.

To realise the benefits, we need to be bold. That is why we have said that by 2050 our state will have net zero emissions. We want to send a clear signal to businesses around the world: if you want to innovate, if you want to perfect low carbon technologies necessary to halt global warming - come to South Australia.

South Australia can be a low carbon electricity powerhouse. We have the ability to produce almost all of our energy from clean and renewable sources and export this energy to the rest of Australia.

We want our state to be the showcase for clean technologies, creating the jobs of the future.

We have already begun the transition to a low carbon economy and have demonstrated that it is possible to decouple economic growth from emissions. Between 1990 and 2012/13 we reduced our emissions by 9 per cent while growing the economy by over 60 per cent.

The change from traditional to low carbon industries will be felt by those workers and communities who rely upon them. We need to support the community and workers through this change. We want South Australia to be the just transition capital of the world; ensuring a fair and equitable transition to a low carbon economy.

The growth of renewable energies, which now supply 41 per cent of the state's electricity, has created over \$6 billion of investment. To increase our ambition, we will need significant investment from the private sector.

This government is leading by example. We have asked the market for low carbon solutions for the government's power needs. We are using the government fleet to introduce hybrid, electric and/or low emissions vehicles to the market. In all situations, we will prioritise solutions which result in investment and create local expertise and jobs.

As part of this economic transformation the State Government and Adelaide City Council will work together to make Adelaide the world's first carbon neutral city.

The world is moving towards a low carbon economy. Leading this transition will position South Australia at the forefront of research and innovation, attracting investment and creating jobs for the future.



Jay Weatherill

Jay Weatherill
Premier of South Australia



Ian Hunter

Ian Hunter
Minister for Climate Change

SUMMARY OF NEW INITIATIVES

THEME 1: SOUTH AUSTRALIA LEADING ON CLIMATE CHANGE

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Introducing an ambitious net zero emissions target
 Signing the Under2MOU
 Advocating for a national emissions trading scheme
 Embedding the net zero emissions target in legislation, policy and decision-making
 Decarbonising government's electricity supply
 Developing a comprehensive net zero emissions engagement programme
 Supporting workers to make the transition to a low carbon economy
 Representing the views of workers in climate change decision-making
 Incorporating ecologically sustainable development principles in planning legislation
 Facilitating the green economy – establishing Green Industries SA
 Considering a carbon accounting mechanism for government activities
 Reviewing the sector agreement process

THEME 2: TOWARDS NET ZERO EMISSIONS

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Implementing the *Low Carbon Investment Plan for South Australia*
 Reducing emissions from the government fleet
 Decarbonising the transport network
 Introducing Building Upgrade Finance legislation
 Maximising opportunities for carbon sequestration
 Facilitating the market penetration of renewable energy
 Supporting development of energy storage options
 Considering net zero emissions requirements for all major projects
 Investigating the opportunity for renewable energy power plants in regional centres
 Investigating potential new renewable technologies for the state
 Investigating improvements in the energy efficiency of buildings

THEME 3: CARBON NEUTRAL ADELAIDE

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Developing a Carbon Neutral Adelaide action plan
 Installing solar photovoltaic panels on low income households
 Showcasing emerging battery storage technology
 Improving the energy efficiency of government buildings
 Increasing Adelaide's green infrastructure

THEME 4: INNOVATING TO DRIVE A RESILIENT AND COMPETITIVE LOW CARBON ECONOMY

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Launching Smart City technologies
 Supporting the uptake of electric vehicles
 Attracting international investment
 Stimulating innovation

THEME 5: CREATING A PROSPEROUS AND RESILIENT STATE

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Developing a state wide, whole-of-government Adaptation Action Plan
 Building coastal resilience
 Implementing water sensitive urban design
 Managing bushfire risk

THEME 6: BUILDING COMMUNITY CAPACITY TO ACT

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Introducing a carbon neutral community challenge
 Facilitating behaviour change
 Introducing a Premier's Climate Change Council award



TOWARDS A LOW CARBON ECONOMY





South Australia is a leader in climate change action. In 2007, we introduced the nation's first climate change legislation – the *Climate Change and Greenhouse Emissions Reduction Act 2007* – embedding an emissions reduction target in law. This legislation also enshrined a renewable energy generation target. Our supportive policy and regulatory frameworks have provided transparency and certainty to investors, resulting in 41 per cent of the state's electricity generated from renewable energy sources in 2014/15. We have demonstrated great capacity for innovation, achieving significant growth in the renewable energy and clean tech sectors. By acting early and introducing significant measures to address climate change, South Australia has already commenced the transition towards a low carbon economy.

The pace of action on global climate change is gathering speed. In the face of unequivocal evidence that our climate is warming¹ there is global agreement through the United Nations Framework Convention on Climate Change (UNFCCC) to limit the increase in global mean temperature to two degrees celcius above pre-industrial levels. In response, world political and economic leaders, at national and sub-national levels, are increasingly demonstrating their commitment to reduce emissions, including Australia's key economic and trade partners. In addition, over 1700 companies, including major global asset owners, have made commitments through the UNFCCC to climate change action such as reducing emissions, increasing energy efficiencies and using renewable energy sources.

¹ IPCC, 2014

In light of the global imperative for action, changes to national and international policy settings and the challenges we face as a state, now is an opportune time for South Australia to renew its climate change approach and commitments. It is timely to build on our existing strengths and strong leadership record, leveraging off the momentum we have already created, to set goals and targets that will guide our transition to a low carbon future. This will see the convergence of economic and climate change policy, and position the state to be part of, and make an important contribution to, a carbon-constrained global economy.

MAKING THE TRANSITION

Moving early will give South Australia a strong competitive advantage, opening the door to growing overseas markets in renewable and clean technologies. As well as contributing to the global decarbonisation effort and increasing our resilience to climate change impacts, decarbonisation will facilitate the shift to more compact and connected urban development², incorporating smarter and more sustainable transport systems and diversified energy systems. Decarbonised, compact cities have reduced infrastructure costs, provide more vibrant markets and create an environment that encourages innovation and ideas³. They are more liveable, with improved air quality and green space, providing health and well-being benefits.

As South Australia makes the transition to a low carbon economy, the mix of energy sources that are used to produce electricity will gradually shift. Natural gas has around half the greenhouse gas content of coal. It is a flexible energy source, with the capacity to respond quickly to changes in electricity demand. Gas will therefore continue to play an important role in the transition process, providing an essential complement to renewable technologies. Energy markets will need to make structural transformations. Resilient frameworks will be critical to allow energy markets to continue to perform under the low carbon regime, delivering safe, secure and reliable electricity supplies to households, businesses and industry.

As our economy changes, there will be an associated shift away from traditional manufacturing and industrial processes and a move towards clean energy technologies. This will have implications for workers and local communities, particularly in the energy supply, transport and industry sectors. Government will play an important role in supporting local communities to make the transition, and to ensure that the process is just, and without undue impacts on workers, communities or the environment. Demonstrating this, in November 2015, the government announced a \$7 million grant assistance package for the Upper Spencer Gulf and Outback region, which is facing significant challenges due to the downturn in the mining sector and the impending closure of the Port Augusta Power Station and Alinta Energy's Leigh Creek coal mine. The package will provide grants to local communities and businesses to undertake regional projects that will create jobs and drive economic growth in the region.

Government will also play an important role in supporting innovation and investment in low carbon technologies; providing education and training to equip people with the skills required to make the transition; and ensuring ongoing consultation between government, workers and union representatives. South Australia's strengths in education and the potential for these to be applied to a transitioning workforce offer a significant market opportunity, in both an international and domestic context.

SEIZING OPPORTUNITIES

The transition to a low carbon economy provides significant opportunities for renewal and transformation. Making the most of these opportunities will rely on partnerships, collaboration and a shared understanding of what it means to live in a carbon-constrained world. No single group can achieve results in isolation. All sectors – government, business, industry, research organisations and the community – will have specific, and critical, roles to play.

² *South Australia's Low Carbon Economy Experts Panel, 2015*

³ *Ibid*



South Australia's economic priorities⁴ provide a strong foundation for action by all stakeholders towards achieving our aspirations for net zero emissions. These include specific priorities to:

- unlock the full potential of the state's resources, energy and renewable assets
- transform the economy through fostering an environment of innovation
- ensure that small businesses have access to capital and global markets
- promote our international connections and engagement.

Taking action now can avoid significantly increased costs in the future. By moving early, South Australia will be well-placed to capture the benefits of transitioning to a low carbon economy. For example, there is potential to export our expertise in clean tech development and adaptation solutions to emerging international markets such as China and India. By strategically positioning our economy and low carbon credentials, we can attract more overseas investment in clean energy, foster new industries, build resilient and prosperous communities and, in doing so, strengthen South Australia's position amongst world leaders in tackling climate change.

To maximise such opportunities, we must build on our strengths. Our plentiful supply of natural energy sources gives South Australia the potential to be a net exporter of renewable energy⁵. Our abundant renewable electricity and rich resource base, combined with our manufacturing expertise, provides opportunities to position the state as a centre for energy intensive mining and manufacturing industries⁶. Significant market opportunities are also available for energy storage solutions arising from the state's high penetration of solar photovoltaic systems, with potential to attract and develop technology suppliers and expertise.

National policy settings that facilitate the transformation process will be critical. South Australia will continue to advocate for national regulation and policy that sets a carbon pricing mechanism and robust, long term emissions reduction targets.

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty that was negotiated at the Earth Summit, held in Rio de Janeiro in 1992. The UNFCCC has 196 contributing parties, including Australia. The UNFCCC is a treaty with the objective to *'stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system'*. The UNFCCC provides a framework for negotiating specific international protocols, such as the Kyoto protocol, that may set binding limits on greenhouse gases. A new global climate agreement will be negotiated at the Paris UNFCCC Conference of Parties, to be held in December 2015.

⁴ <http://economic.priorities.sa.gov.au/home>

⁵ South Australia's Low Carbon Economy Experts Panel, 2015

⁶ Ibid

SETTING A NET ZERO EMISSIONS TARGET

The government is committed to positioning South Australia as a leader on climate change. This will require decisive and ambitious action. To ensure the state is fully prepared to make the transition to a low carbon economy, and to demonstrate leadership by example, the government will introduce a new target to achieve net zero emissions by 2050. This will provide a new focus for action by all sectors and send a strong signal that further and more ambitious action to reduce our emissions is required.

With the introduction of this target, South Australia now has a suite of ambitious targets to guide action over coming decades:

- South Australia will achieve net zero emissions by 2050.
- Adelaide will be the world's first carbon neutral city.
- South Australia will achieve \$10 billion in low carbon investment by 2025.
- South Australia will generate 50 per cent of its electricity from renewable sources by 2025.
- South Australia will improve the energy efficiency of government buildings by 30 per cent of 2001 levels by 2020.

GREENHOUSE GAS EMISSIONS REDUCTION AND LOW CARBON ENERGY COMMITMENTS OF AUSTRALIA'S MAIN TRADE PARTNERS



INDIA

- Reduce emissions intensity per unit of GDP by **33-35%** on 2005 levels by 2030
- Renewable energy target of 175GW of installed capacity by 2022



SOUTH KOREA

- **37%** emissions reduction on business as usual levels by 2030



EUROPEAN UNION

- **40%** emissions reduction below 1990 levels by 2030



CHINA

- A peaking of emissions by 2030 at the latest
- **60-65%** reduction in emissions intensity per unit of GDP on 2005 levels by 2030
- Increase share of non-fossil fuel energy to approximately 20% by 2030



UNITED STATES

- **26-28%** reduction in emissions below 2005 levels by 2025

A NEW STRATEGY FOR THE FUTURE

South Australia's Climate Change Strategy 2015-2050 outlines the government's aspirations for the future and provides a framework for renewed effort and action. The Strategy outlines new initiatives that will put us on the path towards achieving South Australia's ambitious new emissions reduction target and building resilience to the climatic changes we are already starting to see. The Strategy builds on achievements of the 2007 Climate Change Strategy⁷, the leadership that has been demonstrated by industry, the community and the government to date, and on the significant achievements of our award-winning adaptation framework⁸. It also responds to the Premier's Climate Change Council Pathways to 2050 vision⁹ for South Australia to be a low carbon, resilient economy by 2050.

The Strategy is organised into six themes:

1. South Australia taking the lead on climate change action
2. Towards net zero emissions
3. Showcasing Carbon Neutral Adelaide
4. Innovating to drive a resilient and competitive low carbon economy
5. Creating a prosperous and resilient state
6. Building community capacity to take action on climate change.

The Strategy incorporates advice from the South Australian Low Carbon Economy Experts Panel (the Experts Panel), established by the government to review South Australia's current action and provide recommendations for further action. Members of the Experts Panel were Dr John Hewson, economist and former leader of the Liberal Party and the federal opposition; Ms Anna Skarbek, Executive Director of ClimateWorks; and Dr Frank Jotzo, Director of the Centre for Climate Economics and Policy, Australian National University.

The Panel was asked to provide specific advice on climate change targets and objectives for the State to 2050. It was also asked to provide recommendations on key strategies and actions needed to meet these objectives, maximise opportunities, and ensure that South Australia's economy is best placed to adjust to a carbon-constrained future. The Panel provided its final report to the government in November 2015¹⁰. Their recommendations for action have been incorporated into the Strategy.

To complement the state's ambitious new net zero emissions target, and demonstrate the importance of action at the sub-national level, the government has committed to sign the Subnational Global Climate Leadership Memorandum of Understanding (Under2MOU)¹¹ – by doing this, we join a group of sub-national governments who are committed to ambitious actions to limit greenhouse gas emissions to 80-95 per cent below 1990 levels by 2050. We intend to surpass this MoU commitment as we strive towards our net zero emissions goal.

Further demonstrating our drive to reduce emissions, we have released the *Low Carbon Investment Plan for South Australia*¹² (Low Carbon Investment Plan) – this provides strategies to achieve a target of \$10 billion worth of investment in low carbon energy generation by 2025. The government has also established a unique partnership with the Adelaide City Council that aims to see Adelaide as the world's first carbon neutral city – initiatives include increasing use of renewable energy, improving resource efficiency and waste management, and transitioning to cleaner transport modes.

Within the broad framework provided by this Strategy, these latest commitments will drive further actions to reduce our emissions and reach our target of net zero emissions by 2050.

⁷ Department of the Premier and Cabinet, 2007

⁸ Department of Environment, Water and Natural Resources, 2012

⁹ Premier's Climate Change Council, 2014

¹⁰ South Australia's Low Carbon Economy Experts Panel, 2015

¹¹ http://under2mou.org/?page_id=228

¹² Department of State Development, 2015

WHAT WE HEARD

A public consultation process was undertaken to give South Australians the opportunity to provide input to the new Climate Change Strategy. Feedback was invited on a series of climate change consultation papers on key themes including innovation, emissions reduction, leadership and adaptation. Contributions were invited via an online discussion forum and written submissions. A series of workshops was held across the state, including industry-focussed and adaptation workshops. Members of the Premier's Climate Change Council actively encouraged engagement across a broad range of stakeholders.

During the consultation period, more than 300 people attended the workshops, 46 people contributed to the online discussion forum and more than 200 written submissions were received.

The key messages from industry and business centred around jurisdictional collaboration to develop clear and consistent policies; effective and efficient use of regulation; ensuring energy security and affordability; developing partnerships; increasing energy efficiency opportunities; and the importance of support for a sustainable business transition to a low carbon economy.

Local government and natural resources management boards raised a broad range of issues. These included behaviour change underpinned by community engagement and education; continued leadership on climate change including funding, target setting and effective use of regulation; the use of sector agreements as a vehicle for collaboration with the state government; and progressing adaptation actions, such as green infrastructure, carbon sequestration and support for vulnerable citizens.

Environment and non-government organisations strongly advocated for increased renewable energy generation, particularly solar thermal; increased emissions reduction targets; community education and behaviour change; incentives to underpin the uptake of low carbon technologies; and support for skills development to transition the workforce in light of the closure of the Northern Power Station.

General community feedback welcomed the State Government's climate change leadership and called for information and behaviour change programs to underpin household decision-making. The community responded strongly in support of the increased uptake of renewable energy, including solar thermal in Port Augusta; the uptake of electric vehicles; effective use of regulation; increased investment in waste and recycling; and support for low income households to improve energy efficiency and increase the use of renewable energy.

A more detailed analysis of the issues raised during consultation is provided in a summary report available on the government's *YourSay*¹³ website. Workshop summaries and written submissions (unless marked in-confidence) are also available on the *YourSay* website.

¹³ <http://yoursay.sa.gov.au/>



WHAT WE'VE ACHIEVED



REDUCING EMISSIONS

With the introduction of the *Climate Change and Greenhouse Emissions Reduction Act 2007* (the Act), South Australia became the nation's first jurisdiction to enact specific climate change legislation, which sets a target to reduce greenhouse gas emissions by at least 60 per cent of 1990 levels by 2050. According to the latest greenhouse accounting data from the Australian Government, our net emissions in 2012/13 were nine per cent below 1990 levels. During this time, our Gross State Product (GSP) increased by more than 60 per cent, demonstrating that economic growth can be decoupled from growth in greenhouse gas emissions (Figure 2).

LEADING THE NATION ON RENEWABLES

South Australia acted early on renewable energy and our regulatory frameworks are considered to be the most supportive in the country. After exceeding our renewable energy target to generate 33 per cent of electricity from renewable sources by 2020, we have revised our target upwards, aiming to generate 50 per cent of the state's electricity from renewable energy sources by 2025.

In 2014/15, 41 per cent of our electricity was generated from renewable sources, including 34 per cent generated from wind energy.

Around \$6.6 billion has been invested in the renewable energy industry to date; around 40 per cent, or \$2.4 billion, has been invested in regional areas. The state's Low Carbon Investment Plan¹⁴ sets a new target of achieving \$10 billion investment in low carbon energy generation by 2025.

South Australia was the first jurisdiction to provide a premium feed-in tariff mechanism to support the installation of solar photovoltaic systems. As a consequence, we have one of the highest penetrations of rooftop solar in the national electricity market with installations on one in four households. This figure continues to grow, further stimulating the creation of jobs in the renewables industry.

FACILITATING RENEWABLE ENERGY

South Australia is the first jurisdiction to enact legislation that specifically allows a wind farm developer to apply for a licence to build and operate a wind farm on Crown land that is subject to a pastoral lease, and for the wind farm to co-exist with the activities of pastoral leaseholders. The *Pastoral Land Management and Conservation (Renewable Energy) Amendment Act 2015* (the Act) also expedites access to pastoral land for solar energy projects. The legislation ensures that 95 per cent of the licence payment is passed on to pastoral lessees and native title holders. In total, the Act provides renewable energy investors with access to Crown land that comprises 40 per cent of the state's land area.

In 2002, South Australia was the first jurisdiction in Australia to introduce planning guidelines for wind farms, at a time when the first deployment of wind farms was occurring in Australia. In 2012, the *Statewide Windfarms Development Plan Amendment* was approved to provide greater certainty to the community and investors about the development of wind farms in the state. The policy explicitly provides for wind farms in all rural type zones in the state, with the exception of valuable environmental and scenic areas.

TONSLEY INNOVATION DISTRICT

The government is transforming the former Mitsubishi Plant at Tonsley into a purpose-built precinct that brings high-value manufacturing and technology-based businesses together with the education and research sectors. By providing the facilities and infrastructure to facilitate creative collaboration between these groups, Tonsley represents a new future for innovation and manufacturing in the state, with a strong focus on green design and sustainable building practices. In July 2015, the Tonsley district was recognised as a world leader in sustainable design when it was awarded a 6 Star Green Star Communities certification by the Green Building Council of Australia. Tonsley is the only urban renewal project in Australia to receive this level of recognition.

In addition to the Tonsley Innovation Partnership, a number of companies that manufacture and supply innovative, clean technologies have established in South Australia. Specialisations include solar thermal energy, alternative liquid fuel technologies such as biodiesel, solar photovoltaic technology and battery storage solutions.

¹⁴ Department of State Development, 2015

REDUCING WASTE TO LANDFILL

The waste management and resource recovery industry in South Australia has an annual turn-over of around \$1 billion, contributes \$500 million annually to Gross State Product and employs around 4,800 people¹⁵. South Australia also has the highest per capita recycling rate in Australia – nearly 80 per cent of total waste generated is recovered.

South Australia has achieved a 27 per cent reduction in waste to landfill since 2003/04. The waste sector contributes around three per cent of South Australia's greenhouse gas emissions (Figure 1). This is largely from the release of methane, which is produced when organic matter breaks down. Energy is also used to manufacture products and materials, which often end up in landfill. The more we can recycle, the less energy we use to replace materials that are discarded. South Australia has one of the highest recycling rates in Australia. Our Container Deposit Scheme, which diverts large volumes of bottles and drink containers from landfill to recycling, came into operation in 1977. It was the only scheme of its type in Australia until 2012, when the Northern Territory introduced a similar scheme.

South Australia's new waste strategy¹⁶ includes targets to reduce municipal solid waste to landfill by 70 per cent by 2020; to reduce commercial and industrial waste to landfill by 80 per cent by 2020; and to reduce construction and demolition waste to landfill by 90 per cent by 2020.

PREMIER'S CLIMATE CHANGE COUNCIL

The *Climate Change and Greenhouse Emissions Reduction Act* established the Premier's Climate Change Council to provide independent advice to the Minister for Climate Change on matters associated with reducing greenhouse gas emissions and adapting to climate change. The Council takes a leadership role in consulting with business, the environment and conservation movement, and the wider community.

Since its inception, the Council has advocated for, and supported, key policy initiatives including: development of South Australia's Climate Change Adaptation Framework; managing risks from sea level rise and coastal inundation; establishing a Building Upgrade Finance mechanism; and facilitating climate smart precincts.

Most recently, the Council supported development of the Climate Change Strategy by delivering its advice through *South Australia's Climate Change Vision – Pathways to 2050* (2050 Vision) and consulting with industry about working towards a low carbon economy.

THE GOYDER INSTITUTE FOR WATER RESEARCH

The Goyder Institute for Water Research (the Goyder Institute) is a partnership between the State Government and the CSIRO, Flinders University, the University of Adelaide and the University of South Australia. Since 2010, the Goyder Institute has established itself as an independent expert science advisor providing quality, evidence-based knowledge on water management issues important for South Australia. In 2015, the Institute delivered *SA Climate Ready*¹⁷, a comprehensive set of downscaled climate projections for South Australia. Importantly, the data is aligned to the state's natural resources management regions, so it provides locally relevant data to assist decision-making by regional communities about adaptation planning and integrated vulnerability assessments (Figure 3).

¹⁵ Zero Waste SA, 2015

¹⁶ Office of Green Industries, 2015

¹⁷ South Australian Government, 2015

NATIONALLY RECOGNISED ADAPTATION PLANNING

In 2012, South Australia released the state's first Adaptation Framework, *Prospering in a Changing Climate*, in partnership with the Premier's Climate Change Council and the Natural Resources Management Council. The Framework's regional approach, involving partnerships between local government, regional development committees and natural resources management boards, encourages grassroots partnerships to developing well-informed adaptation solutions and ownership at the regional scale.

South Australia's collaborative, regional approach to adaptation was awarded the 2013 National Climate Change Adaptation Research Facility's (NCCARF) Adaptation Champions Award, and the 2013 Resilient Australia National Award. Resilient South, formed by the cities of Onkaparinga, Holdfast Bay, Marion and Mitcham was awarded the 2014 NCCARF Climate Adaptation Champion in the local government category for their regional

adaptation plan for Southern Adelaide. Eyre Peninsula farmer and member of the Premier's Climate Change Council, Mr Brian Foster, was named the winner of the individual category of the Climate Adaptation Champions awards in 2013. Councils from the Yorke and Mid North region were also recognised as the 2013 State winners in the local government category, in partnership with Regional Development Australia (Yorke and Mid North) and the Northern and Yorke Natural Resources Management Board.



CLIMATE CHANGE IN SOUTH AUSTRALIA





In 2012/13, South Australia's net greenhouse gas emissions were 29.25 megatonnes (Mt) of carbon dioxide equivalent (CO₂e¹⁸). Approximately 75 per cent of these emissions came from the production and consumption of energy, including electricity generation and transport fuels. Agriculture was the next largest emitter, contributing 19 per cent of the state's total emissions. The primary industries sector, including forestry and some forms of agricultural land use, plays an important role in storing carbon. This sector recorded a net negative emissions figure in 2012/13 (Figure 1).

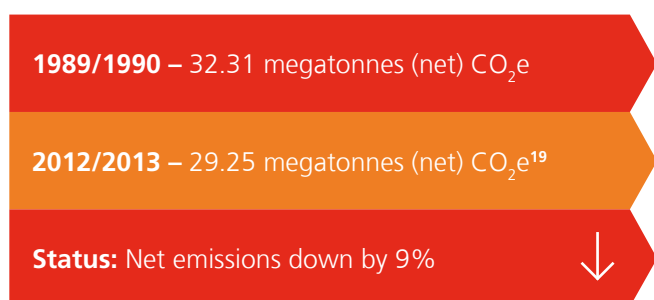
Australia became a party to the Kyoto Protocol in 2008 and met its target of limiting emissions to 108 per cent of 1990 levels over the Kyoto reporting period of 2008-2012. Over that period, Australia's net emissions averaged 103 per cent of 1990 levels, while South Australia's emissions averaged 91 per cent of 1990 levels.

18 Carbon dioxide equivalent – a measure that captures the different global warming potential of all greenhouse gases in terms of an equivalent amount of carbon dioxide

South Australia's net greenhouse gas emissions have been reducing since 2005/06 (Figure 2). The latest estimate indicates that net greenhouse emissions in 2012/13 were nine per cent below the 1990 baseline. Our GSP during this period grew more than 60 per cent from \$55.2 billion in 1989/90 to \$94 billion in 2012/13, demonstrating that economic growth can be decoupled from growth in greenhouse gas emissions (Figure 2).

South Australia's increase in renewable energy generation continues to contribute to reduced emissions from the energy sector. Modern agricultural practices and increased waste recycling, including hard waste and wastewater recycling, have also contributed to this decline.

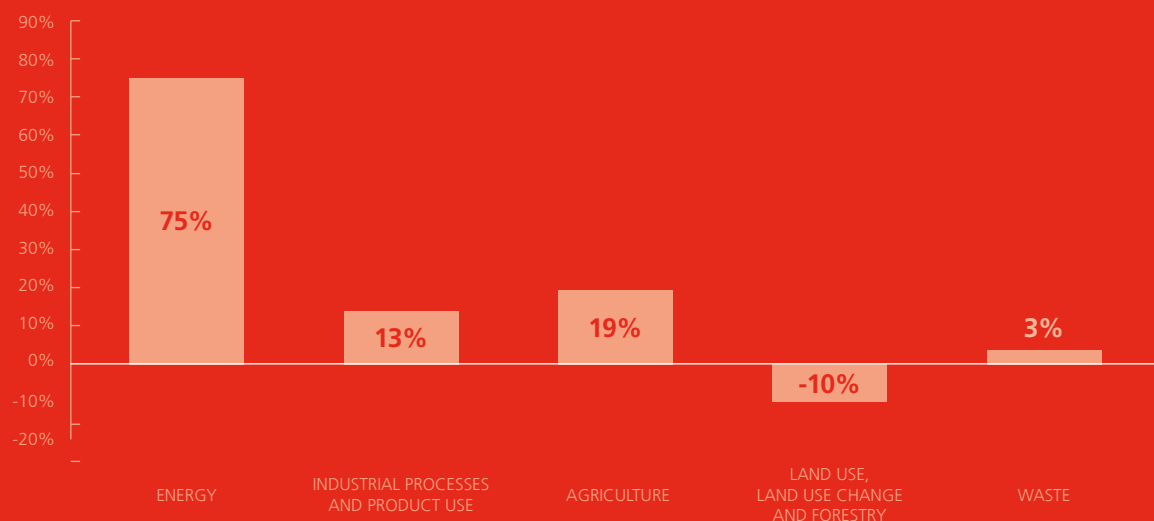
South Australia's Emissions Statistics



There has been a significant reversal in emissions from the land use, land use change and forestry sectors, which were a significant source of emissions prior to 1990. In 2012/13, these sectors represented a significant emissions sink. The turn-around is a consequence of regulatory reforms introduced in the 1980s that ended broad-acre vegetation clearance, and increased revegetation and plantation forestry.

¹⁹ Includes emissions associated with electricity interconnector imports and exports
²⁰ Department of the Environment, 2015

FIGURE 1: SOUTH AUSTRALIA'S GREENHOUSE GAS EMISSIONS PROFILE IN 2012/13²⁰





HOW CLIMATE CHANGE IS AFFECTING SOUTH AUSTRALIA

Changes in the climate system have already been observed at the global and local scales. Climate change will have varied impacts on all parts of the community and sectors of the South Australian economy. South Australia is projected to experience²¹:

- continued increases in average temperatures across all seasons
- more hot days and warm spells, and fewer frosts
- decreases in annual rainfall, with decreasing rainfall in the cool season (although rainfall projections in the warm season are unclear)
- increases in the intensity of extreme rainfall events and time spent in drought

- continued mean sea level rise and an increase in the height of extreme sea level events
- a harsher fire weather climate in the future.

As part of its work on SA Climate Ready, the Goyder Institute has developed, for the first time, projections for each individual weather station across the state's natural resources management regions that extend to 2090, for 'intermediate' and 'high' emissions pathways.

Figure 3 shows the projected temperature and rainfall changes across the state's natural resources management regions to 2050 under an intermediate emissions scenario.

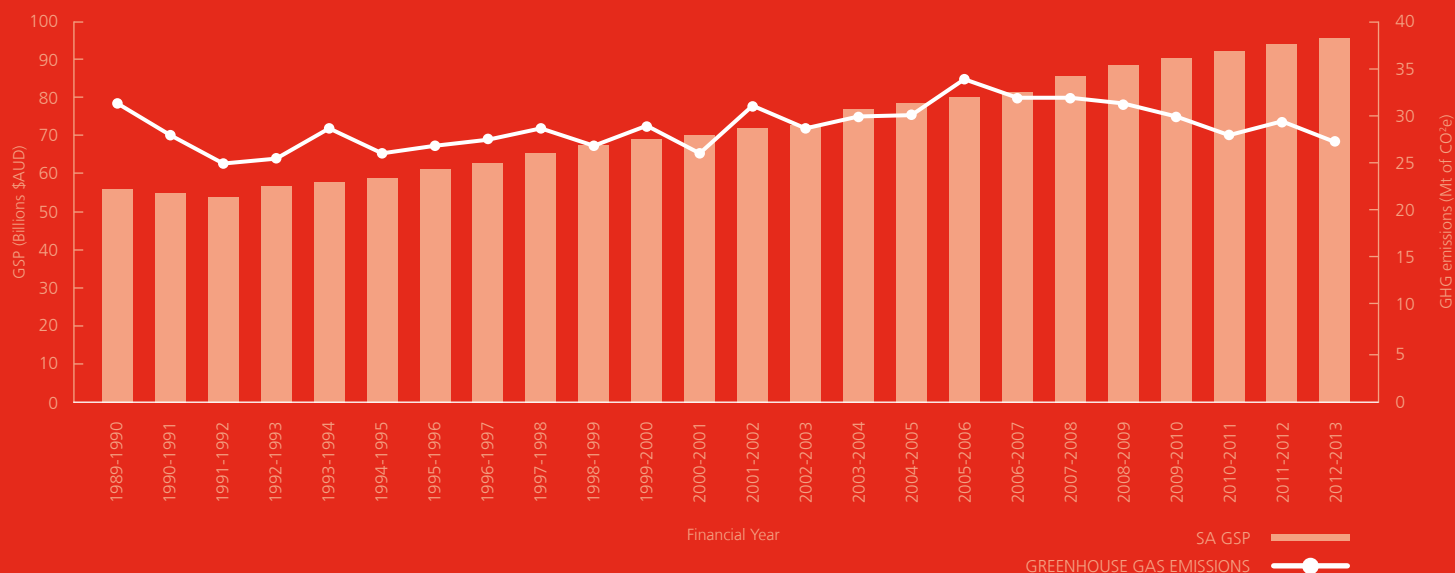
21 CSIRO and Bureau of Meteorology, 2015

22 Australian Bureau of Statistics, 2014

23 Department of Environment, 2015

FIGURE 2: SOUTH AUSTRALIA'S ECONOMIC GROWTH²² AND GREENHOUSE GAS EMISSIONS 1989-90 TO 2012-13²³

Gross State Product versus greenhouse gas emissions (exclusive of emissions associated with electricity interconnector imports and exports) 1989-90 to 2012-13



Increased temperatures and more frequent extreme weather (including heatwaves, floods and storms) will impact on the built and natural environments and communities. Vulnerable members of the community will be particularly susceptible, including the elderly, the very young, those who live in remote or vulnerable coastal communities and low income households.

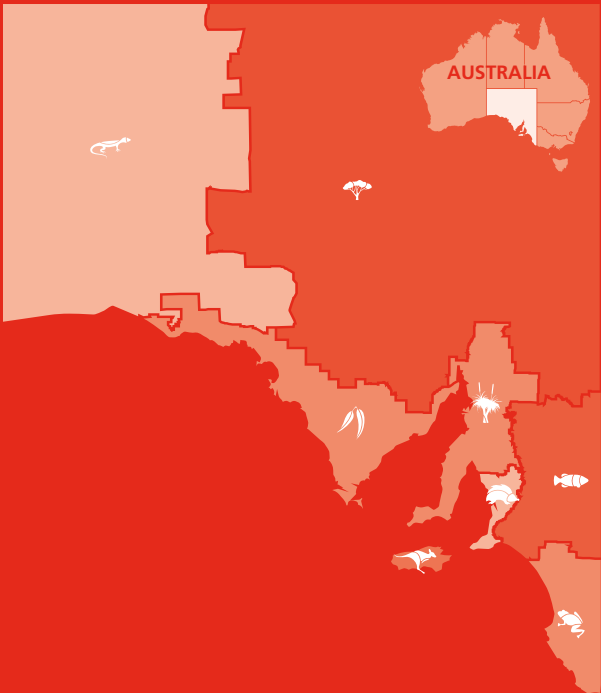
Changing rainfall patterns and higher evaporation rates are likely to pose additional challenges for South Australia's water supplies, which have implications for business and industry, agriculture, households and the natural environment. Sea level rise threatens a number of sectors including tourism, emergency management, stormwater management, insurance and finance. Almost all types of major infrastructure in South Australia are likely to be at risk from storms, coastal inundation, flooding, higher temperatures and increased bushfire frequency.























24 Charles, S.P. and Fu, G., 2015

The Goyder Institute's Climate Ready SA data on regional climate change projections for South Australia is helping to improve planning and decision-making by providing:

- SA Water with information on the potential impacts of climate change on water quality in Adelaide Hills reservoirs, helping to inform future investment decisions about water treatment infrastructure
- the Department of Planning, Transport and Infrastructure with information to help determine the risk of local groundwater affecting a proposed, new section of Adelaide's North South Transport Corridor between Torrens Road and the River Torrens
- the Department of Environment, Water and Natural Resources with information on the predicted impact that changes in groundwater levels may have on Middlepoint Swamp, a groundwater dependent ecosystem in the Lower South East.

FIGURE 3: TEMPERATURE AND RAINFALL PROJECTIONS FOR SOUTH AUSTRALIA TO 2050 UNDER AN INTERMEDIATE EMISSIONS SCENARIO



	Temperature °C	Rainfall
 Natural Resources Kangaroo Island	 +1.1°C	 -7.5%
 Natural Resources Northern and Yorke	 +1.4°C	 -12%
 Natural Resources SA Murray-Darling Basin	 +1.3°C	 -10.4%
 Natural Resources Eyre Peninsula	 +1.2°C	 -9.5%
 Natural Resources Adelaide and Mt Lofty Ranges	 +1.3°C	 -6.8%
 Natural Resources South East	 +1.1°C	 -4.8%
 Natural Resources SA Arid Lands	 +1.5°C	 -12.1%
 Natural Resources Alinytjara Wilurara		

Source: This graphic includes median projections for 2050 based on an intermediate emissions scenario RCP 4.5. Changes are relative to the 1995 baseline. The full range of projections for this and other scenarios are available in the Technical Report²⁴.

THE STRATEGY



THEME 1 SOUTH AUSTRALIA TAKING THE LEAD ON CLIMATE CHANGE ACTION

South Australia has been a climate change leader since introducing the nation's first climate change legislation in 2007. It is important that we continue, and strengthen, this leadership role if we want to capitalise on the opportunities arising from global action on climate change, and ensure that the state is in the best position to attract investment in clean technologies.

Effective approaches will depend on partnerships and collaborative approaches between government, industry, business and the research sector. Each of these groups will have a different, but complementary, role to play.

"The world is looking to governments for a long term vision and a new model of stable and secure growth. The world is looking for a near term plan that provides an orderly transition to a sustainable, climate neutral, long term development path."

Christiana Figueres, Executive Secretary United Nations Framework Convention on Climate Change – November 2015

The State Government must continue to show leadership on climate change. This was a strong and consistent message arising from the community consultation process and the leading recommendation of the Premier's Climate Change Council 2050 Vision. A primary role for government will be to send a clear and strong signal to business, industry and the community that further, and more serious, action on climate change is expected, while promoting South Australia's low carbon and adaptation leadership. The state's targets for net zero carbon emissions – that will be enshrined in legislation – and a carbon neutral Adelaide, strongly support South Australia's climate change leadership credentials.



In moving to a low carbon economy, the government will play a critical role in supporting the community and industry in the transition to a low carbon economy. State Government will continue to advocate a strong position to the Australian Government to ensure that national policy frameworks facilitate effective action. The government also has a responsibility to provide policy certainty for business and industry; establish consistent and effective regulatory frameworks; and, as a climate change leader, to collaborate with other sub-national governments to facilitate global action.

In addition, the State Government has an important role in providing the community with accessible and easy-to-understand information to help people understand the issues and make appropriate lifestyle choices. This was a strong message arising from community consultation. Households and individuals can play their part by using energy more efficiently, conserving water, taking public transport, walking or cycling more often and reducing waste by recycling and reusing.

Local governments will be at the front line in dealing with climate change. They will lead by assisting their local communities to understand and adapt to the impacts of climate change and to reduce carbon emissions. Councils will play a critical role in developing local policy and operational solutions to manage risks associated with impacts on buildings and infrastructure. They can leverage opportunities offered by state and national government initiatives and inform governments

about the on-the-ground needs of local communities, particularly vulnerable members of the community, and those who live in remote or coastal areas that are particularly susceptible to the impacts of climate change.

Supported by the right fiscal policies and regulatory settings, the private sector will drive innovation and development of clean tech solutions that will put us on the path towards a low carbon economy. Large emitters can demonstrate leadership and increase efficiencies by making significant cuts to their emissions, embedding climate change in decision-making and adopting more sustainable practices (see case studies). The research sector will continue to play a crucial role by filling knowledge gaps and stimulating innovation through partnerships with industry and business. South Australia's three universities and associated research institutions have significant expertise and capacity to support South Australian businesses in the drive for further innovation and growth.

NEW INITIATIVES

The following new initiatives will further consolidate South Australia's leadership on climate change. Additional actions will be developed in consultation with key sectors and the community.

Introducing an ambitious net zero emissions target

The South Australian Government is introducing a target to achieve net zero emissions by 2050. A net zero emissions target is critical to limit global temperature rise to under two degrees celcius. This will signal the government's commitment to a low carbon economy and reinforce our national and international leadership on climate change. The government will also work to build broad-based support for achieving the target, with a view to obtaining a bipartisan position that will provide the policy certainty required to catalyse private sector participation and investment.

On the back of our significant renewable energy achievements to date, the government will also consider setting a longer term, more ambitious renewable energy target that could facilitate the transition process.

Signing the Under2MOU

To support and complement South Australia's ambitious net zero target, the government will sign the Global Climate Leadership Memorandum of Understanding (Under2MOU). The Under2MOU identifies action being taken by sub-national jurisdictions around the world to reduce emissions. As a signatory to the Under2MOU, the government is demonstrating its clear and lasting commitment to reduce emissions to 80 to 95 per cent below 1990 levels by 2050, the level of emissions reduction believed necessary to limit global warming to less than two degrees celcius by the end of the century. Our new net zero emissions goal surpasses the Under2MOU commitment.

Advocating for a national emissions trading scheme

South Australia will continue to advocate for a national emissions trading scheme to provide a market-based mechanism for reducing emissions, as putting a price on carbon is considered to be the most effective mechanism for reducing emissions across the globe. In the absence of a national policy position emerging in a timely manner, the State Government will assess how best to position South Australia in the global low carbon economy.

Embedding the net zero emissions target in legislation, policy and decision-making

To send a clear and consistent signal to the South Australian community, the *Climate Change and Greenhouse Emissions Reduction Act 2007* will be amended to legislate for the state's new emissions reduction target of net zero emissions by 2050. The government will also embed the net zero target and the Carbon Neutral Adelaide target into key policy documents, and introduce a requirement that these targets be taken into account when making decisions on major issues such as planning and infrastructure provision. This will not only signal the government's clear intent, but will also provide policy certainty to businesses, critical for ensuring an effective and just transition process. Ensuring the land use planning system incorporates climate change into decision-making was a key recommendation of the Premier's Climate Change Council 2050 Vision.

Decarbonising government's electricity supply

The government has released an expression of interest for innovative proposals that will deliver reliable and affordable low carbon electricity to meet up to 100 per cent of the government's electricity needs. The expression of interest seeks ideas that will service up to 481 gigawatt hours of electricity per annum, and contribute towards Adelaide's plan to become the world's first carbon neutral city. The use of government procurement levers will stimulate investment in clean tech solutions, helping to drive job creation in the sector.

Developing a comprehensive net zero emissions engagement programme

The government will develop an engagement program to engage industry sectors in the move to a net zero emissions economy. Key elements of the program will include developing a detailed understanding of the cost-effective abatement opportunities available to each sector, and clearly articulating the net zero emissions target and what this will mean to key sectors including communities and households. The government will also consider using the sector agreement provisions of the *Climate Change and Greenhouse Emissions Reduction Act 2007* to establish partnerships with key stakeholders, particularly major emitters, to develop net zero emissions action plans.

Supporting workers to make the transition to a low carbon economy

The South Australian Government recognises that workers in carbon intensive industries stand to be hit hard by the transition to a low carbon economy. In addition to being a leader in climate change, the government is committed to being a leader in ensuring a fair and just transition and to providing a voice to workers and unions to ensure appropriate supports are in place. South Australia's key strengths in education and training provide a strong foundation for helping to prepare workers for the shift to a low carbon economy. The government will work with the education and training sectors to determine the future skills required by the workforce to facilitate the transition, how these can best be delivered and the most effective means of supporting workers during this period of change. The state's strengths in this area could also position South Australia internationally as a leader in the delivery of transitional education and training.

Representing the views of workers in climate change decision-making

To ensure that the views of workers are represented in climate change decision-making, the Minister for Climate Change will appoint a representative from the union movement to the Premier's Climate Change Council, the key advisory body to the government on climate change matters.

Incorporating ecologically sustainable development principles in planning legislation

The *Planning, Development and Infrastructure Bill 2015* has been developed to provide a guiding framework for South Australia's planning reforms. The planning system is a significant lever for achieving emissions reductions and facilitating effective adaptation. To this end, the Bill will include in its 'Principles of Good Planning' (which further guide the objects) a requirement that development and infrastructure should minimise greenhouse gas emissions and risk from current and future impacts, while providing for climate resilient communities and ecosystems.

Facilitating the green economy – establishing Green Industries SA

Green Industries SA has been established to build on the achievements of Zero Waste SA. The waste management and resource recovery industry is a significant sector of South Australia's economy. The sector has an annual turnover of around \$1 billion, contributes \$500 million to GSP directly and employs about 4,800 people²⁵. Within its remit, Green Industries SA will continue to work on waste management, resource efficiency and recycling, with an emphasis on encouraging innovation and economic growth through development of the 'green economy'.

Considering a carbon accounting mechanism for government activities

Procurement and approvals processes are important low cost policy levers that the government can use to help drive the transition to a net zero emissions economy. To this end, the government will consider the use of a carbon accounting mechanism in government activities.

²⁵ Zero Waste SA, 2015

Reviewing the sector agreement process

The government will review the sector agreement process, in consultation with stakeholders, to ensure that sector agreements are effective in promoting partnership approaches that will assist in delivering the net zero emissions target and building a resilient state. The continued use of partnership agreements to facilitate action is supported by the Experts Panel, the Premier's Climate Change Council and the community consultation process.

The *Climate Change and Greenhouse Emissions Reduction Act 2007* provides for the creation of voluntary sector agreements between the government and businesses, industries, community groups and regions to facilitate a partnership-based approach. They may include commitments to undertake action, or to promote or facilitate strategies that will reduce emissions and increase resilience. Since the legislation was enacted, the government has entered into more than 20 sector agreements that have delivered a wide range of benefits.

HIGHLIGHTS

- In 2015, South Australia became the first jurisdiction in Australia where the State Government and a city council have both signed international agreements on climate change. The **Compact of States and Regions** and **Compact of Mayors** are United Nations-supported commitments by sub-national governments. The Compacts will require the State Government and the Adelaide City Council to report annually on greenhouse gas reduction targets in a standardised format to allow comparisons across regions to support international climate governance processes.
- In his role as the **co-chair of the States and Regions Alliance**, the Premier acts as a climate ambassador for the Asia Pacific region to support efforts to build strong

sub-national climate leadership. South Australia is a founding member of the States and Regions Alliance and its longest standing co-chair. The States and Regions Alliance (formed by The Climate Group²⁶) brings together sub-national government leaders from around the world to share expertise and influence international dialogue on climate action.

- In May 2015, the Premier hosted a **Jurisdictional Meeting on Climate Change** attended by representatives from seven Australian jurisdictions to discuss collaboration on climate change and receive a briefing from the Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC), Ms Christiana Figueres. As an outcome of the meeting, jurisdictions agreed to progress a number of actions, including harmonisation of energy efficiency schemes, driving the uptake of large-scale renewable energy, sharing best practice adaptation planning and action and discussing progress towards developing state-based emissions reduction targets.
- The government has entered into a **sector agreement with the Adelaide City Council** to deliver the **Carbon Neutral Adelaide initiative**. This strategic partnership between State and Local Government demonstrates the parties' joint aspiration for the City of Adelaide to become the world's first carbon neutral city. The sector agreement outlines a number of key areas of focus, including development of a shared vision and a supporting framework and action plan (to be developed in 2016).

26 The Climate Group is an international, not-for-profit organisation that works with corporate and government partners to develop climate finance mechanisms, business models that support innovation and supportive policy frameworks.

- In February 2014, the **Premier's Climate Change Council** released *South Australia's Climate Change Vision – Pathways to 2050*, which makes eight key recommendations to government and identifies 29 priority actions, with a focus on action over the next 10 to 15 years. The key recommendations are:
 - continue to show strong leadership on climate change
 - develop bipartisan agreement for an enduring commitment
 - undertake comprehensive consultation across community, industry, business and government
 - reduce emissions by capturing all cost-effective abatement
 - identify funding sources for the implementation of adaptation priorities
 - prioritise support for the most vulnerable members of the community
 - ensure the land-use planning system supports adaptation and transition
 - partner with business to create the settings for an industry-led transition.
- The government has collaborated with the Local Government Association of South Australia on climate change initiatives, formalised through the signing of an inaugural **sector agreement** in 2008 (renewed in 2013). The sector agreement has supported a shared program of work focussing on climate risk management, adaptation and mitigation. The partnership is currently focussed on progressing regional adaptation planning across the state; undertaking the Science to Solutions project (see Theme 5); developing a Building Upgrade Finance scheme (See Theme 2); and increasing understanding of the state's coastal zone management.



THEME 1: CASE STUDIES



1. INDUSTRY LEADING – SANTOS

Santos, one of Australia's largest producers of natural gas, has actively participated in action to address greenhouse gas emissions and integrated climate risk into its business framework. This includes initiating its own sustainability reporting; engaging with development of international reporting guidelines for the oil and gas industry; measuring and managing internal performance; and investing in low carbon technologies. Additionally, Santos has been a strong and consistent voice in government policy development.

Across its operations, Santos' energy efficiency program delivers annual energy savings equivalent to approximately 235,000 tonnes CO₂e. The following energy efficiency measures, implemented at the Moomba plant in the far north of the state, deliver a total annual savings of 149,000 CO₂e.

Energy efficiency measures implemented at the Moomba facility – Since 2008

Project	Investment	CO ₂ e savings/year
Single export residue compressor	\$2m	51,500
Waste heat boiler refurbishment	\$2m	62,000
CO ₂ train absorber level control valves	\$1m	15,500
Sole refrigeration compressor		18,000
Boiler upgrade		2,000
TOTAL		149,000

2. RESEARCH LEADING – THE COOPERATIVE RESEARCH CENTRE FOR LOW CARBON LIVING

The Cooperative Research Centre for Low Carbon Living (CRCLCL) is a national research and innovation hub for the built environment. The CRCLCL has a focus on collaborative innovation, bringing together property, planning, engineering and policy organisations with leading Australian researchers. A key aim of the CRCLCL is to help cut Australia's residential and commercial carbon emissions by 10 megatonnes by 2020. The CRCLCL aims to achieve this through developing low carbon building construction materials and increasing the evidence base for government policy and planning, which will help to inform the development of climate change policies and programs.

As a member of the CRCLCL, the South Australian Government is involved in the following projects, which will contribute to the Carbon Neutral Adelaide initiative:

- Integrated energy, transport, water and waste demand forecasting and scenario planning for precincts including the Adelaide Living Laboratory Hub
- Urban micro-climates – a comparative study of major contributors to the Urban Heat Island effect in three Australian cities (Sydney, Melbourne, Adelaide)
- The Adelaide Living Laboratory Hub (see Theme 2: Highlights) delivering a research agenda across the three living laboratory locations in Adelaide – Tonsley, Bowden and Lochiel Park

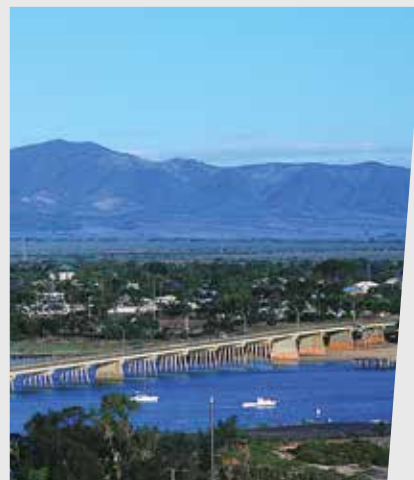
Workshops organised by the CRCLCL, involving government agencies, the Adelaide City Council, research institutions and members of the Premier's Climate Change Council, have explored innovation pathways, additional research opportunities and the potential for other CRCLCL projects to help achieve the Carbon Neutral Adelaide vision.



3. LOCAL GOVERNMENT LEADING - UPPER SPENCER GULF COMMON PURPOSE GROUP

The Upper Spencer Gulf region has a strong heritage and capability in industrial manufacturing, and is located in close proximity to diverse renewable and low carbon energy sources such as wind, solar, geothermal and algae. The region therefore has significant potential to leverage private investment to help diversify the local economy, create jobs and increase prosperity and long term sustainability for the Spencer Gulf region.

Recognising this, the three cities that form the nucleus of the region – Whyalla, Port Augusta and Port Pirie – have formed the Upper Spencer Gulf Common Purpose Group to combine existing capabilities and position the region as an ideal site to trial and test renewable energy technology, research and innovation, development and commercialisation.





THEME 2 TOWARDS NET ZERO EMISSIONS

The government will adopt a new target of net zero emissions by 2050, and embed it in legislative and policy frameworks. The Experts Panel advises²⁷ that achieving net zero emissions is critical to limit global warming to two degrees, and that adopting this target will ensure South Australia is well positioned to take advantage of opportunities in a low carbon world.

The Experts Panel recommends that significant work be done across all sectors to develop a detailed understanding of the most cost-effective abatement options and strategies to foster greater uptake of renewable and clean technologies. The State Government will be responsible for advocating for supportive national policy frameworks, facilitating the integration of state renewable energy systems, advocating for national renewable energy integration, and ensuring that mechanisms and policies put in place at the state level are flexible enough to respond to future national and international policy settings.

South Australia's net emissions in 2012/13 were nine per cent lower than in the baseline year of 1989/90. It is important that we maintain this momentum to successfully continue our transition to a more sustainable, low carbon future.

TARGETS

Achieve net zero emissions by 2050

Status: Net emissions down by 9% in 2012/13 from 1990 levels

Achieve \$10 billion in low carbon investment by 2025

Status: \$6.6 billion invested in renewables in 2014/15

Generate 50% of our electricity from renewable sources by 2025

Status: 41% of the state's electricity grid generation was powered by renewable energy in 2014/15

Improve the energy efficiency of government buildings by 30% by 2020

Status: 24% improvement in energy efficiency of government buildings in 2014/15 from the 2000/01 baseline.

²⁷ South Australia's Low Carbon Economy Experts Panel, 2015



Recent commitments flag the government's intent. The Low Carbon Investment Plan provides a framework to achieve the \$10 billion low carbon investment target. In 2015, the government committed to sign the Global Climate Leadership Memorandum of Understanding (Under2MOU), requiring the pursuit of ambitious emissions reduction targets²⁸. And South Australia also signed the United Nations-supported Compact of States and Regions, which commits signatories to report annually on targets and emissions reduction progress at an international level.

While around 75 per cent of our emissions come from the production and consumption of energy, including electricity generation and transport (Figure 1), a further 19 per cent come from the agriculture sector and 13 per cent from industrial processes. Therefore, to reduce emissions at the scale required will not only involve changing the way we produce and use energy, but will also require improved farming practices and more sustainable and efficient industrial and manufacturing processes.

In developing its report for the South Australian Government, the Experts Panel was guided by a high-level abatement technical analysis for South Australia and by the global *Deep Decarbonisation Pathways Project*²⁹. The Project provides nationally grounded analysis on how countries can transition to a very low carbon economy. It comprises 16 countries and is convened under the auspices of the Sustainable Development Solutions Network, a global initiative of the United Nations. It identifies four pathways for Australia to achieve a decarbonised economy³⁰:

- Energy efficiency – recognised worldwide as the largest opportunity to cost-effectively abate emissions from the energy sector. Strategies include reducing the amount of energy used to provide products and services, more efficient manufacturing processes, improved vehicle technologies such as electric and hybrid cars, and smart urban design.
- Low carbon electricity – replacing existing fossil fuel-based electricity generation with renewable energy such as wind, solar, geothermal and biofuels and utilising carbon capture and storage.
- Electrification and fuel switching – increasing the electrification of transport, buildings and industry to deliver substantial emission reductions from these sources. This can involve using fuel generated from low carbon energy sources such as renewable technologies, and switching from high-carbon fossil fuels to bioenergy and lower-carbon fuels such as gas and biofuels.
- Non-energy emissions – reducing non-energy emissions by implementing best practice farming systems, improving industrial processes (e.g. emissions from cement and steel production), and offsetting the remainder through bio-sequestration.

²⁸ See Theme 1 for more information

²⁹ Denis, A. et. al., 2014

³⁰ Ibid

SOUTH AUSTRALIA'S RENEWABLE ENERGY STATISTICS – 2014/15



41% of our electricity was generated from renewable sources



16 operating wind farms supplied 34% of our electricity



1 in 4 households have solar installations



\$6.6 billion has been invested in the renewable energy industry

The Experts Panel's final report³¹ indicates that South Australia could achieve a 56 per cent reduction in emissions by 2030 and net zero emissions (100 per cent reduction) by 2050 by utilising these four deep decarbonisation pathways. The high-level modelling³² commissioned for the report indicates that the biggest opportunities for reducing emissions in South Australia lie in decarbonising the state's electricity generation, electrification, reducing non-energy emissions and carbon forestry to offset residual emissions (Figure 4).

The Panel's analysis indicates that the decarbonisation of electricity in South Australia will be very important for achieving net zero emissions by 2050. Indications are that our electricity supplies could be almost completely decarbonised by 2050, with the state generating enough renewable energy to meet demand and potentially exporting to interstate markets.

With an increasingly decarbonised electricity system, electrification offers significant additional abatement potential. Modelling indicates that together with fuel switching, electrification could represent around 26 per cent of the total abatement required to achieve net zero emissions. The Deep Decarbonisation Pathways project indicates that road transport presents the greatest potential for emissions abatement in the transport sector, primarily through cars and light commercial vehicles shifting from internal combustion engines to electric and hybrid drivetrains. In South Australia, electrification and fuel switching in the transport sector could provide 16 per cent of the total abatement task, with a further nine per cent from electrification initiatives in the building and industry sectors.

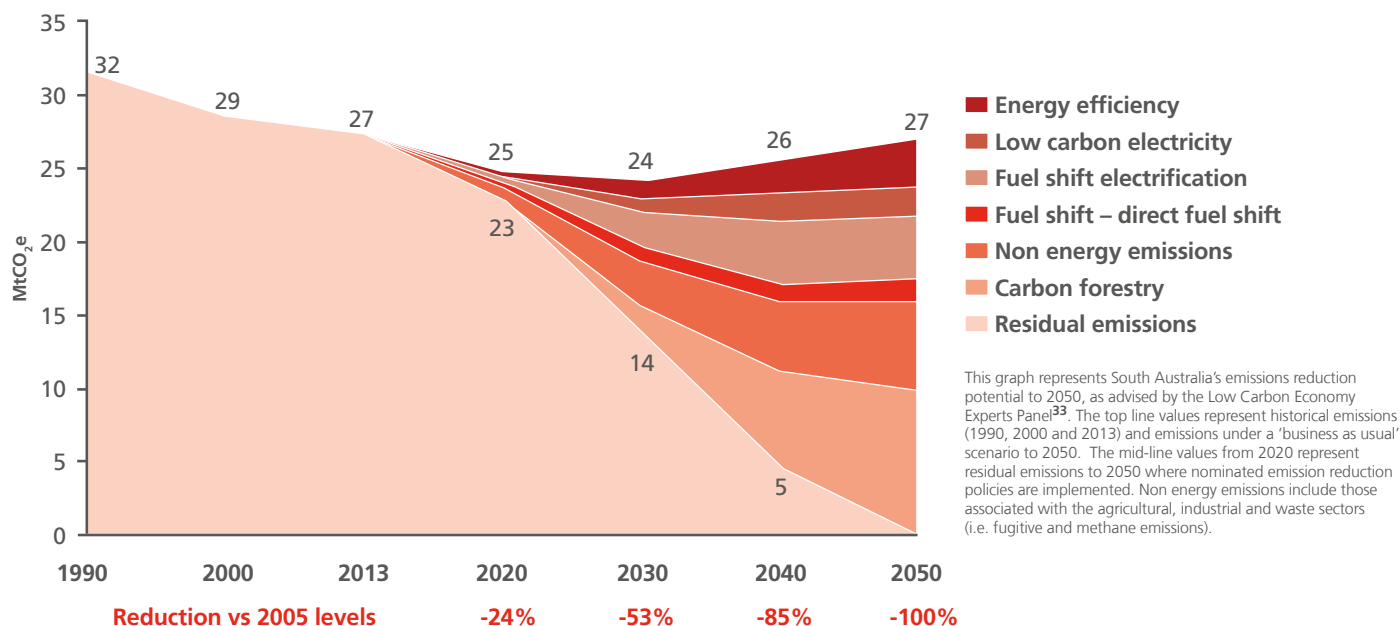
Modelling of South Australia's abatement options also shows that reducing non-energy emissions could provide around 24 per cent of the total abatement task. Significant abatement could be achieved from industry system and process improvements, particularly in the iron, steel and cement sectors. Together with capturing fugitive emissions, this is estimated to represent around 12 per cent of the total abatement potential. Improvements to agricultural and waste management systems and land use changes could provide the remaining abatement.

While carbon forestry is not a practical long term solution, it could offer a useful transition strategy to offset residual emissions that cannot otherwise be abated in the short to medium term. The Panel's analysis indicates that carbon forestry offsets could deliver around 29 per cent of the total abatement task required to achieve net zero emissions by 2050. It is estimated that this could be achieved by utilising only 37 per cent of the total carbon forestry potential available in the state.

³¹ South Australia's Low Carbon Economy Experts Panel, 2015

³² The specific modelling of emissions reduction potential for South Australia was estimated at a high level based on existing analyses by ClimateWorks Australia. A more detailed analysis would be required to understand the exact potential and costs for the state.

FIGURE 4: South Australia's emissions reduction opportunities MtCO₂e



NEW INITIATIVES

New initiatives to drive emissions reduction are outlined below. These are in addition to the new initiatives outlined in Theme 1, including adoption of the net zero emissions target and the commitment to sign the Under2MOU. Further actions to reduce emissions will be developed in consultation with key sectors and communities, including an action plan to deliver the Carbon Neutral Adelaide vision (see Theme 3).

Implementing the Low Carbon Investment Plan for South Australia

The government's *Low Carbon Investment Plan for South Australia*³⁴ outlines current and new initiatives to underpin achievement of the government's target for \$10 billion investment in low carbon energy generation by 2025. The plan is framed around four strategies: (i) clear policy and efficient regulatory environment; (ii) information to inform investment; (iii) sponsoring uptake and wider market deployment; and (iv) facilitating projects to leverage funding and support. The plan includes four new initiatives:

- Supporting the uptake of electric vehicles (see Theme 4)
- Reducing emissions from the government fleet (see below)
- Investigating opportunities for high penetration renewable energy and battery storage power plants in regional centres (see below)
- Decarbonising the government's electricity supply (see Theme 1).

Reducing emissions from the government fleet

As recommended by the state's Low Carbon Investment Plan, the government is seeking expressions of interest for opportunities to reduce emissions from the government fleet, with a focus on the provision of electric and hybrid vehicles. Using government procurement levers will create the impetus for innovation and change, which in turn will stimulate investment and create jobs.

³³ South Australia's Low Carbon Economy Experts Panel, 2015

³⁴ Department of State Development, 2015

Decarbonising the transport network

The government's Integrated Transport and Land Use Plan³⁵, released in July 2015, is critical to achieving our net zero emissions target. The Plan outlines the following electrification and fuel-switching initiatives that will be progressively implemented to reduce emissions and increase energy efficiency in the transport sector:

- Completing electrification of the metropolitan rail network
- Reintroducing trams on inner metropolitan routes and within the CBD
- Reconfiguring and modernising the bus network including more rapid transit corridors
- Extending and improving cycling and walking networks
- Providing targeted behaviour change programs to shift people's travel patterns to low and zero emission options
- Promoting fuel efficient vehicles and the use of renewable and low emission fuels.

Introducing Building Upgrade Finance

Building Upgrade Finance (BUF) is a mechanism that helps building owners to access funds to improve the energy, water and environmental efficiency of existing commercial buildings. Consistent with advice from the Premier's Climate Change Council, and the results of public consultation, the government has introduced the *Local Government (Building Upgrade Agreements) Amendment Bill 2015*, which provides for the implementation of the BUF mechanism in South Australia³⁶. The mechanism has potential to stimulate jobs and investment in the property sector, provide opportunities for local manufacturers and suppliers of clean technologies, improve the quality and amenity of buildings, and reduce the impact of rising energy and water costs on businesses. Mechanisms like BUF will help to achieve the ambition of Carbon Neutral Adelaide.

Maximising opportunities for carbon sequestration

The land and forestry sectors in South Australia now provide a significant carbon sink, as a consequence of regulatory reform that ended broad-acre vegetation clearance and increased revegetation and plantation forestry (see 'Climate Change in South Australia'). To build on this abatement potential, a new state Carbon Sequestration Strategy will be developed to provide direction to, and outline opportunities for, carbon sequestration activity in South Australia. The Experts Panel reports that South Australia has an excellent opportunity to develop a profitable offsets industry. As a first step, a discussion paper will be developed that outlines the challenges and risks, current science (including PIRSA's New Horizons program – see Highlights below), and potential opportunities (including capturing existing activity such as revegetation under methodologies accredited under the Carbon Farming Initiative³⁷). The discussion paper will be developed in consultation with natural resource management boards, primary producers and industry.

Facilitating the market penetration of renewable energy

The Expert's Panel advises that South Australia's significant penetration of renewable energy positions the state well to become a future net exporter of renewable energy³⁸. To facilitate the transition to a cleaner electricity generation mix, the government will seek funding from the Australian Renewable Energy Agency (ARENA) and the Clean Energy Finance Corporation (CEFC) to help resolve electricity transmission grid stability, infrastructure funding, and the regulatory and energy market issues associated with a high penetration of renewable energy.

Supporting development of energy storage options

The government will investigate how regulatory and procurement mechanisms can be used to promote the deployment and uptake of cost-effective energy storage solutions. Energy storage will be critical to realise our net zero emissions target, and to address grid stability and electricity generation issues. Work is already underway to demonstrate cutting-edge battery storage systems in a number of high profile city buildings such as the South Australian Museum, State Library and the Art Gallery of South Australia (see Theme 3).

³⁵ Department of Planning, Transport and Infrastructure, 2015

³⁶ The *Local Government (Building Upgrade Agreements) Amendment Bill 2015* was introduced to the Upper House of the South Australian Parliament in February 2015.

³⁷ Australian Government, n.d.

³⁸ South Australia's Low Carbon Economy Experts Panel, 2015

Considering net zero emissions requirements for all major projects

The government will investigate appropriate policy settings for requiring all new major projects to offset their emissions to achieve net zero emissions using South Australian-based offset mechanisms, including carbon forestry. This would stimulate growth in the state's offsets industry and facilitate land-based sequestration options.

Investigating the opportunity for renewable energy power stations in regional centres

The government is investigating opportunities for high penetration renewable energy and battery storage power plants in regional centres.

Investigating potential new renewable technologies for the state

Large-scale wind farms and rooftop solar photovoltaic systems currently dominate renewable energy technologies in South Australia. To ensure diversification and future grid stability, the government will investigate other technologies to incorporate into the state's renewable energy portfolio. This will include considering state-based reverse auctions to steer investment in desired directions and locations and minimise costs to consumers. The government has already started to develop the foundations for a substantial and sustainable bioenergy industry in South Australia.

Investigating improvements in the energy efficiency of buildings

The government will work with State and Federal members of the Australian Building Codes Board to develop improvements to the energy efficiency measures included in the National Construction Code, which sets minimum requirements for the design, construction and performance of Australian buildings. Energy efficiency measures in the Code have not been updated since 2010 and there is an opportunity for upgraded measures to be included in a new version of the Code, to be introduced in 2019. The government will also consider working with other jurisdictions to drive improvements to national appliance standards that will help improve the energy efficiency of buildings. The government will also consider making state-based variations to the National Construction Code.

HIGHLIGHTS

- In July 2015, the Government released the **Integrated Transport and Land Use Plan**³⁹. The Plan works in concert with the Planning Strategy and the Strategic Infrastructure Plan to integrate longer term planning for land development, transport and infrastructure. In Greater Adelaide, the Plan will support higher density living along primary public transport corridors, including expansion of the tram system. The Plan will also see completion of the electrification of metropolitan rail services, new park and ride facilities and extensions to cycling infrastructure. Implementation of the Plan will enable more people across the state to connect from home to work to leisure by low emission public transport and zero-emission, active transport options.
- **Upgrade of Adelaide's metropolitan rail network** began in 2012 with the extension of the southern line to Seaford and electrification of the Seaford and Tonsley lines. Electrification of the Gawler line is planned and it is anticipated that all lines will be electrified by 2050. The Glenelg tramline was also upgraded and extended to North Terrace in 2007 and to the Entertainment Centre in 2010 including a dedicated 'Park and Ride' facility. Investment to date on these initiatives is approximately \$2.6 billion.
- Around 20 per cent of buses in the **Adelaide metro fleet** now use compressed natural gas, with the remainder running on B20 or B5 biodiesel blends. The government is also trialling two diesel-electric hybrid buses that improve fuel efficiency by 20-30 per cent. Ongoing trialling of new technologies and transformation of public transport systems to low carbon energy sources is envisaged over time to progressively decarbonise the public transport fleet.
- The government is continuing to invest in, and encourage, **cycling and walking** by extending and improving the Bike Direct network; installing bicycle boulevards and greenways; changing regulations to increase the safety of cyclists on our roads; delivering behaviour change programs within workplaces, communities and schools that encourages safer, greener more active travel; and providing online resources, such as the *Cycle Instead* Journey Planner, that shows people safe cycling routes.

³⁹ Department of Planning, Transport and Infrastructure, 2015

- The government's **Low Emission Vehicle Strategy** is encouraging the uptake of hybrid electric and plug-in electric vehicles. Seven electric vehicle charging stations have been installed throughout the CBD.
- The **New Horizons** project, being undertaken by Primary Industries and Regions SA, aims to significantly contribute to long term carbon sequestration (potentially millions of tonnes of CO₂e). This project will also significantly improve broadacre crop and livestock pasture production and reduce erosion risk on poorly performing soils, which comprise approximately 40 per cent of the state's broadacre farming land. Traditional dryland farming has focused on the top 10 centimetres of soil. New Horizons is the next revolution in agriculture as it focuses on modifying the soil profile to 50 centimetres. Three trial sites were established in 2013 to scientifically test whether placing clay, nutrients and organic matter at a range of soil depths would improve root growth, plant vigour and water use efficiency, ultimately leading to increased fertility and carbon sequestration. Key findings from the first year of the project are that the best treatments at least doubled dry matter production and doubled grain yield.
- Bioenergy is a largely untapped resource in South Australia. The government's **Bioenergy Roadmap** project is mapping the state's bioenergy potential. The project will also identify localised areas for further investigation in consultation with local community and industry groups. For more information, see the *Low Carbon Investment Plan for South Australia*.
- The **Retailer Energy Efficiency Scheme (REES)**, administered by the Essential Services Commission of South Australia, was introduced in January 2015. The REES will run until 2020 and builds on the Residential Energy Efficiency Scheme, which ran from 2009 to 2014 (see Case Study 6). As well as households, the new REES will be available to the commercial sector including retailers, education precincts, health services and hotels. The aim of the new REES is for large energy retailers, such as AGL, Origin Energy and Energy Australia, to help households and businesses to reduce their energy use by offering energy audits and advising on energy efficiency activities, with a particular focus on low income households.
- The University of Adelaide, in partnership with a number of companies and with support from the government, is building a **mobile energy storage testing unit** for on-grid and off-grid use to enable simulation and performance testing of energy storage systems under a range of environmental conditions.
- The Cooperative Research Centre (CRC) for Low Carbon Living is a national research and innovation hub that aims to help cut Australia's emissions from the built environment. Through the CRC, the government is a partner in the **Adelaide Living Laboratory Project**, where researchers from the University of South Australia are working with government, industry and community to develop low carbon living solutions. Tonsley is one of the project's three locations that seeks to demonstrate pathways for low carbon living with both local and national implications. The other two locations are the award-winning Lochiel Park Green Village, a leading energy and water efficient housing development; and the Bowden Urban Village project which is a leading example of excellence in urban design, community development and environmental sustainability. Stage one of the project is underway at Tonsley and Bowden, with a focus on integrated energy, water, waste and transport modelling and the development of energy demand management solutions.

THEME 2: CASE STUDIES

4. LOW CARBON ELECTRICITY

ADELAIDE AIRPORT'S ROOFTOP SOLAR SYSTEM

Adelaide Airport has announced it will be installing Australia's largest airport rooftop solar system on its short term multistorey car park. The system will have a capacity of 1.17 megawatts and will require installation of 4500 solar photovoltaic panels. Following completion of the project, the airport's total installed capacity will be 1.28 megawatts, expanding from the existing 114 kilowatt system that was installed in 2007, following completion of the new terminal. The solar system will significantly reduce grid electricity consumption during the day as well as greenhouse gas emissions associated with operating Adelaide Airport. In 2014, Adelaide Airport Ltd was the first Australian airport to be recognised by the global Airport Carbon Accreditation program for its efforts to reduce greenhouse gas emissions.



5. ELECTRIFICATION AND FUEL SWITCHING

KANGAROO ISLAND VISIBLE SOLAR PROJECT

In a partnership between the Kangaroo Island Council and the Regional Development Authority, a state-of-the-art, dual-axis solar array system has been installed at the Kangaroo Island Airport to provide a visible demonstration of the benefits of advanced solar power generation technology. Launched in February 2014, the project has been a catalyst for further expansion of green energy infrastructure on the Island and was funded by Renewables SA. The system is able to track the sun, increasing the energy output by 30 per cent compared to a fixed system. The system's output powers 80 per cent of the airport's energy needs, saving the council at least \$24,000 per year in power bills. The Council has also installed infrastructure to recharge electric cars at five locations around the Island, and has leased three Nissan Leaf electric vehicles. Two of these can be hired by the general public, while the third has been retained for use by the Council. The Council has been recognised with two awards for this project – KESAB 2014 Environmental Initiative and the United Nations Association of Australia's 2015 World Environment Day Local Government Best Specific Environmental Initiative.



6. ENERGY EFFICIENCY

RESIDENTIAL ENERGY EFFICIENCY SCHEME

The Residential Energy Efficiency Scheme ran from January 2009 to December 2014. Under the scheme, large energy retailers supplying more than 5000 customers, including AGL, Origin Energy, Energy Australia and Lumo Energy, were required to provide energy audits and energy efficiency activities to South Australian households, including those on low incomes, to help reduce energy bills and cut greenhouse gas emissions. Between 2009 and 2014, the scheme assisted 245,087 households. During this time, a total of 32,460 energy audits were provided and greenhouse gas emissions were reduced by 1,827,068 tonnes⁴⁰.



40 Essential Services Commission of South Australia, 2014



THEME 3 SHOWCASING CARBON NEUTRAL ADELAIDE

The government has announced its ambition for the City of Adelaide to be the world's first carbon neutral city. The Adelaide City Council and the government have entered into a unique partnership between City and State to achieve this bold vision, underpinned by a sector agreement under the *Climate Change and Greenhouse Emissions Reduction Act 2007*. The partners have released a Carbon Neutral Adelaide Vision and Framework to support development of a detailed action plan in 2016⁴¹.

The Carbon Neutral Adelaide initiative will be an important step towards the state's transition to a low carbon economy.

The aim is for the entire Adelaide City Council area, including the Adelaide Parklands, CBD and North Adelaide, to become carbon neutral. This will deliver a number of benefits, including development and growth of the state's green industries; financial savings; behaviour change; and providing a platform for the roll out of successful, innovative technologies across the state.

In 2013, the City of Adelaide's total emissions were 939,532 tonnes CO₂e. Stationary energy and transport are the primary sources of carbon emissions, contributing 60% and 35% respectively. Waste that was disposed of to landfill generated 5% of the city's emissions (Figure 5).

A balanced and practical approach will be required that delivers jobs and opportunities for innovation, and takes into consideration the credibility of the measures used, costs and the capacity for the community and industry to pay. A package of measures will be used to achieve the carbon neutral goal including:

- Increasing the energy efficiency of city buildings
- Shifting to more sustainable transport options
- Reducing emissions from waste
- Decarbonising electricity supplies
- Offsetting emissions.

TARGET

Adelaide will be the world's first carbon neutral city

⁴¹ Government of South Australia and the Adelaide City Council, 2015



What is carbon neutral?

A community, place or activity is 'carbon neutral' if it is effectively emitting net zero greenhouse gases. Achieving carbon neutrality involves balancing greenhouse gas emissions with activity that removes emissions from the air such as tree planting and storing carbon underground.

Carbon offsets will also be necessary to achieve carbon neutrality in Adelaide; however, the use of offsets will decrease over time. The preferred strategy will be to identify offset opportunities within South Australia.

Achieving carbon neutrality is a significant task that will require efforts beyond local and state governments. Partnerships with other sectors including private, not-for-profit and research organisations, along with involvement from city residents and other South Australians, will be critical to meet the challenge.

NEW INITIATIVES

The following new initiatives will put the state on the path towards achieving the Carbon Neutral Adelaide goal. Additional actions, including a Carbon Neutral Adelaide action plan (see below) will be developed in consultation with key sectors and the community.

Developing a Carbon Neutral Adelaide action plan

The government will work with the Adelaide City Council to develop a Carbon Neutral Adelaide action plan, to be released in 2016. The action plan will set out specific actions to deliver the carbon neutral goal and will be developed in consultation with city users, residents and businesses.

Installing solar photovoltaic panels on low income households

The government plans to install solar photovoltaic panels on 200 low income households in the city to support the Carbon Neutral Adelaide initiative. Also, as a pilot program, solar photovoltaic panels will be installed on all newly built South

Australian Housing Trust properties in 2015/16.

Showcasing emerging battery storage technology

In a city demonstration project, the government will install cutting-edge energy battery storage systems in several high profile city buildings such as the Museum, the State Library and the Art Gallery of South Australia. These buildings all have existing rooftop solar photovoltaic systems. The project will demonstrate how integrating battery storage with solar photovoltaic systems can deliver multiple benefits including emissions reduction, energy load management and reduced energy costs. The trial is expected to commence in 2016.

Improving the energy efficiency of government buildings

A new energy efficiency investment program for government buildings is being developed that mandates all agencies to identify and implement energy efficiency upgrade opportunities in government-owned buildings. The program will work by allowing agencies to retain the financial savings from mandatory energy efficiency upgrades once the initial funding has been repaid in full. These savings will be in the form of reduced operating costs achieved through energy efficiency improvements. The program is expected to stimulate jobs and facilitate investment in clean technologies.

Increasing Adelaide's green infrastructure

To help achieve the Carbon Neutral Adelaide goal, and achieve a greener, more resilient city, the Adelaide City Council has launched a \$1 million Greener Streets initiative to install demonstration projects in the CBD involving green walls, more trees, shrubs and rooftop gardens. Greening the city will deliver

a range of benefits including reducing the urban 'heat island' effect, assisting with rainwater infiltration and mitigation of flooding, and providing improved visual amenity. An initial focus will be the City's northwest corner, where temperatures can be up to three degrees higher than in the City's East End.

In a related program, the government is introducing the *Living Adelaide* initiative, which will increase and link green infrastructure across greater Adelaide to provide a more holistic approach to place management, including planning and design of green space.

HIGHLIGHTS

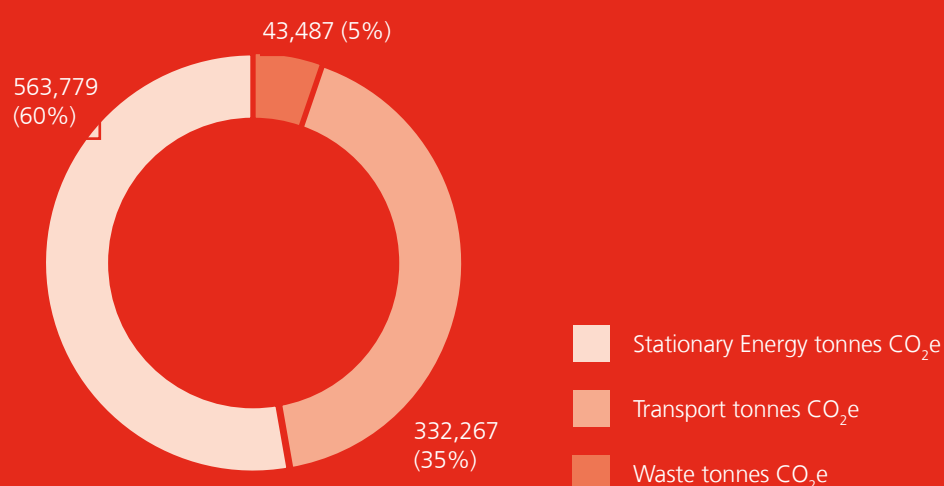
- The government has been in a strategic partnership with Siemens since 2012, through the Tonsley redevelopment project. In January 2015, Siemens offered to undertake a free performance assessment of Adelaide using their **City Performance Tool**⁴², which is used to calculate the environmental and economic impacts of over 70 building, transport and energy technologies including greenhouse gas emissions and air quality. The performance assessment will provide valuable information to help prioritise future investment in best-practice technology and infrastructure to achieve the carbon neutral goal.

- The government and the Adelaide City Council have signed a **sector agreement** to underpin implementation of Carbon Neutral Adelaide (see Theme 1 for more information). The partners have also developed a Carbon Neutral Adelaide vision and framework to guide implementation. The framework will also provide a model for regional mitigation planning.
- The government is continuing to encourage **walking and cycling** in the city. A separated bikeway on Frome Street was introduced in 2014. Within 12 months, nine per cent of cyclists travelling along the bikeway reported their cycling trip had replaced their car trip. Since 2003, the number of people cycling to and within the city has doubled from 5,000 to 10,000 cyclists per day.
- The City of Adelaide was the first city in the world to introduce a **free community bicycle share scheme**. There are plans to extend the scheme to support short trips for business and study around the CBD.

⁴² <https://w3.siemens.com/topics/global/en/intelligent-infrastructure/cities-on-the-move/Documents/Siemens-CyPT-City-Performance-Tool.pdf>

⁴³ Pitt and Sherry, 2015

FIGURE 5: CITY OF ADELAIDE
GREENHOUSE GAS
EMISSIONS 2013⁴³



THEME 3: CASE STUDIES



7. LIGHTING THE WAY

In 2010-2012, the Adelaide City Council participated in a global trial of LED outdoor lighting to test the performance of a variety of LED luminaire products in real-world conditions. The Adelaide City Council was the first council in South Australia and one of the first in the Australia to install LED lights on a large scale and the 'Go Green with Public Lighting' project demonstrates the benefits of upgrading to energy efficient LED lights. So far 1,476 lights have been converted, equating to an energy reduction of 545,012 kWh and a reduction in greenhouse gas emissions of 354 tonnes.



8. SUSTAINABLE CITY INCENTIVES SCHEME

To reduce carbon emissions, the Adelaide City Council's Sustainable City Incentives Scheme is providing reimbursements for the installation of water and energy savings systems, such as solar photovoltaic panels, solar hot water systems, energy storage systems, apartment building energy efficiency upgrades and rainwater tanks. The Scheme is available to all building owners and tenants including businesses, residents, schools, community and sporting organisations within the City of Adelaide. The government is also supporting the scheme.



THEME 4 INNOVATING TO DRIVE A RESILIENT AND COMPETITIVE LOW CARBON ECONOMY

Innovation is a strong catalyst for growth. South Australia's proven capacity for innovation, and the opportunities this provides for job creation and sustainable growth, offers a positive and practical way forward and is the foundation for our successful transition to a low carbon economy.

"THE TRANSITION TO A LOW CARBON ECONOMY WILL BE A STORY OF INNOVATION"

Ross Garnaut, The Garnaut Review 2011: Australia in the global response to climate change

As early movers, we have already seen growth in the state's renewable energy and clean tech sectors. We now have an opportunity to develop and contribute to technologies of global significance as demand for goods and services that will assist the move to a low carbon economy increases, particularly among our Asian trading partners.

The push for innovation will be led by industry. However, there will be a critical role for government to provide supportive regulatory and procurement mechanisms to facilitate growth and job creation, and to support growing export markets. This was a key recommendation in the Premier's Climate Change Council 2050 Vision and a strong message arising from the Green Jobs Forum held in June 2015, where government, industry and research leaders discussed opportunities for government action to support industry growth. Another strong message was the need to deepen collaboration between industry and research institutions to drive innovation.

To capitalise on investment opportunities, we must focus on our areas of economic advantage, including research and development, project demonstration and the development of technological waste and energy solutions. In addition to our expertise in wind and solar technologies, we are also well positioned in regard to biogas and biofuels, renewable energy storage systems, demonstration of innovative approaches to adaptation, carbon sequestration solutions and waste and water recycling.

Several companies have already established in South Australia that are currently involved in the development of innovative technologies including solar thermal and alternative liquid fuel technologies such as biodiesel. Local companies specialising in solar photovoltaic and emerging battery storage solutions are entering the market place.



Inevitably, there will be costs associated with shifting to a low carbon economy. A just transition must ensure that the costs of economic restructuring and the shift to sustainability do not fall on vulnerable sectors. Government, industry, community service organisations and the education and training sectors will need to work together to support workers and local communities through the transition process.

NEW INITIATIVES

The following new initiatives will help to stimulate innovation and growth of the renewable energy and clean tech sectors, including in all forms of low emissions transport. Additional actions will be developed in consultation with key sectors and the community.

Launching Smart City technologies

Based on its successful joint undertaking to provide free Wi-Fi across the Adelaide CBD, global technology company Cisco has entered into a Memorandum of Understanding with the government and the Adelaide City Council to undertake several pilot projects including Smart Parking, Smart Public Lighting and the establishment of an Internet of Things (IoT) Innovation Hub in Adelaide. Two pilot projects have commenced on Pirie Street and Hindmarsh Square to replace existing street lighting with sensor driven LEDs to demonstrate power saving and smart control capabilities. Other pilot projects are being developed to monitor traffic flow, pedestrian movement and power use in government tenanted buildings to help inform future energy saving opportunities. An IoT Innovation Hub, located at the Adelaide City Council administration office on Pirie Street, has been launched to service the needs of innovators and showcase their smart city applications and services.

Supporting the uptake of electric vehicles

Transport contributes almost a quarter of the world's emissions. The uptake of electric vehicles will be a key strategy to cut emissions from the transport sector. There are a range of strategies we will explore to support the uptake of electric vehicles. For example, the government will support a hybrid-electric car share project using a vehicle provided by Australia's largest car share company Go-Get. The project aims to give people the experience of driving an electric car and to showcase local industry capability for solar installation work. For more information, refer to the Low Carbon Investment Plan.

Attracting international investment

To secure investment in new and growing businesses, the government is establishing a dedicated investment agency to attract capital from overseas and interstate, and to work with the private sector to help navigate regulatory and approvals processes. The agency will focus on existing capabilities and strengths including advanced manufacturing. This will provide significant opportunities for the clean tech sector.

Stimulating innovation

Innovative technological solutions will be critical for decarbonisation. South Australia has already made significant advancements, and has seen growth in the clean tech sector. To build momentum, the government will investigate new ways of bringing industry, universities and research organisations together to develop solutions, including mechanisms to facilitate information and data sharing, to help stimulate technical and creative capacity. South Australia will also participate in, and seek to influence, the emerging national innovation agenda.

HIGHLIGHTS

- In January 2015, Cisco declared Adelaide as the first smart and connected **'Lighthouse City'** in Australia. Through its leadership in deploying free outdoor wireless technology, Adelaide is gaining recognition as a smart, digital city.
- In June 2015, the Premier, the Minister for Climate Change and Mr Bruce Carter, Chair of the Premier's Climate Change Council, jointly hosted a **Green Jobs Forum** attended by business leaders and representatives from industry associations and research institutions. The main focus of discussion was what government can do to assist business to create jobs. Strong themes that arose were the importance of government using regulation and procurement levers to support and drive innovation, the need for government to act as an advocate for business and to facilitate connections to growing export markets, and the need to deepen collaboration between industry and the research sector. A second Green Jobs Forum was held in November 2015 to respond to the issues raised.
- In July 2015, Siemens, one of the world's largest engineering and advanced technology firms, opened a new \$5 million purpose-built, **world-class maintenance and repair facility** for its energy technology business at the new Tonsley Innovation District. The establishment of a major international company such as Siemens is a significant boost to Tonsley and will provide an opportunity for the company to partner with the state on a diverse range of critical industries and projects. Siemens advises that the new service centre will deliver a 22 per cent faster turnaround, with 65 per cent more throughput while using 14 per cent less floor space.

THEME 4: CASE STUDIES



9. ZEN TECHNOLOGIES – INNOVATION IN BATTERY STORAGE SOLUTIONS

ZEN Technologies (Power and Energy) Pty Ltd was established in South Australia in 2004, to develop innovative solar and energy storage technologies. The company is a key player in the solar and emerging battery storage market, selling renewable energy systems to households and commercial operations. ZEN Energy recently announced an expanded business model, becoming Australia's first dedicated community energy retail provider, offering zero/low carbon generation options, including solar and battery storage solutions, to power entire new developments and legacy micro grid communities. In 2014, the Department of Environment, Water and Natural Resources (DEWNR) engaged ZEN Technologies to provide a solar and battery storage energy solution for the refurbished Seal Bay Visitor Information Centre on Kangaroo Island. The centre now has a 20 kilowatt fixed ground solar photovoltaic panel system and a 7.5 kilowatt/40 kilowatt hour Powerbank system, providing all the energy needs for this off-grid site.

ZEN Technologies currently has 40 staff based at its Tonsley headquarters; however, business expansion is expected to increase job creation for the South Australian company, including specialist and technical roles in the wider economy, and facilitate the growth of low carbon living and communities.



10. HELIOSTAT SA – INNOVATION IN LARGE SCALE SOLAR TECHNOLOGIES

To facilitate the transition from traditional manufacturing and showcase new industries and innovation, four South Australian partners – Precision Components, the University of South Australia, May Brothers and Enersalt – came together to create Heliostat SA. Using solar thermal energy technology developed by the CSIRO, CSPV concentrated solar photovoltaic (the new multi-junction cells) and conventional photovoltaic PV tracking, Heliostat SA develops, manufactures and constructs utility scale projects. Heliostat SA has successfully established agreements to support the growing energy needs of India, Japan and the Asia Pacific. The agreements will see the deployment of three gigawatts of capacity⁴⁴, with the creation of hundreds of new jobs at Heliostat SA's site at Beverley over the next two years.



11. SUNDROP FARMS – INNOVATION IN SOLAR ENERGY

Sundrop Farms Pty Ltd in Port Augusta is revolutionising horticulture by growing premium produce in an arid climate. Their state-of-the-art greenhouse facility uses seawater and solar thermal energy to produce electricity, desalinate water and warm the greenhouse. The South Australian Government awarded \$345,000 to Sundrop Farms in 2011 to demonstrate the use of solar energy in horticulture. In 2013, the CEFC committed \$40 million in debt finance, which facilitated a growth capital raise from the private sector. This capital underpins construction of a 20-hectare greenhouse facility, which is scheduled for completion in 2016 and is expected to create approximately 175 jobs.

⁴⁴ One gigawatt is equal to one billion watts, enough to supply a city the size of Adelaide.



THEME 5 CREATING A PROSPEROUS AND RESILIENT STATE

Changes in our climate will impact the way we all live and work in South Australia. The responsibility for preparing for these changes will involve all South Australians including individuals, communities, governments, non-government organisations and the business and industry sectors.

Adaptation is the principal way to deal with the impacts of a changing climate. It involves taking practical actions to manage risks from climate impacts, support communities and strengthen the resilience of the economy. By taking early action to understand the likely impacts of climate change across the state, and appropriately staging South Australia's adaptation response, we can optimise our ability to effectively manage risks and capture opportunities.

A successful adaptation approach is primarily about managing risk. Integrating climate change impacts into risk management and other strategic planning activities should become part of everyday decision-making. Many organisations are already considering climate impacts in their everyday business. For example, the primary industries sector is gradually changing its practices to adapt to warmer and drier conditions, including using different watering regimes and changing crop harvesting times. Climate change risk is also being integrated into government planning approaches including state and regional natural resources management plans and regional health plans.

South Australia is recognised as a leader in adaptation planning. Our climate change adaptation framework, *Prospering in a Changing Climate*, developed in partnership with the Premier's

Climate Change Council and Natural Resources Management Council, establishes the processes for South Australians to work together to prepare for the impacts of climate change. At the heart of the framework is a regional approach that empowers communities to collaborate in assessing vulnerability to climate change and articulating responses at the regional scale. Regional adaptation plans outline actions for all partners including local government, natural resources management boards, Regional Development Australia organisations and state government. Actions are varied and range from enhancing community engagement, for example providing information to households on heatwave preparedness, through to infrastructure planning to build resilience to reduce climate risks.

For the State Government, adaptation action will need to be considered by all agencies. A strong message arising from the consultation process during development of this strategy was the need for enhanced coordination of adaptation actions at the state level – to complement and support regional approaches. The planning system will play a key role in facilitating adaptation. The *30-Year Plan for Greater Adelaide*⁴⁵ and the broader state planning strategy provide important policy measures that prepare the groundwork for an effective long term approach to adaptation.

NEW INITIATIVES

The following new initiatives will help to increase South Australia's resilience to the impacts of climate change. Additional actions will be developed in consultation with key sectors and the community.

Developing a state wide, whole-of-government Adaptation Action Plan

The government has invested to support the development of regional integrated vulnerability assessments and adaptation plans across the state. It will be important for some adaptation



responses to be coordinated at a state level to reduce duplication, minimise costs, maximise opportunities for sharing information and ensure that adaptation responses are effective. The government has a clear leadership role in this regard and will develop a state wide, whole-of-government adaptation action plan to guide future work. The action plan will provide a framework for priority adaptation actions by government. Areas of focus will include key issues highlighted in regional adaptation planning processes, such as engagement with industry and support for vulnerable communities. The Premier's Climate Change Council in their 2050 Vision, advised on the need for further state wide prioritisation and support for regional adaptation actions.

Building coastal resilience

South Australia's coastline is particularly vulnerable to the impacts of sea level rise, which has been rising at an average rate of approximately five millimetres per year since 1992⁴⁶. To ensure effective risk management and build the resilience of coastal communities, the Coast Protection Board will extend its work with state and local government and local communities to:

- develop integrated, local coastal protection and adaptation plans for regional settlements along the South Australian coastline (guided by the framework provided by *Prospering in a Changing Climate*)
- identify and define coastal hazards and other features in South Australia's land-use planning system and provide guidance on coastal development to ensure that it is undertaken sustainably
- build on its *Adelaide's Living Beaches Strategy 2005–2025* by developing management and protection strategies for Adelaide's coastline to be implemented post 2025.

**"SOUTH AUSTRALIA'S
INNOVATIVE APPROACH
TO ADAPTATION PLANNING...
ENGAGES LOCAL LEADERS
THROUGH 'REGIONAL
COMMITTEES,' AND SHARES
PLANNING COSTS ACROSS
MULTIPLE LEVELS
OF GOVERNMENT."**

*The Climate Group*⁴⁷

Implementing water sensitive urban design

The government will continue to collaborate with key partners to establish water sensitive urban design (WSUD) as a standard approach in urban design and development. Efforts will be informed by the state policy *Water sensitive urban design – Creating more liveable and water sensitive cities in South Australia*, released in October 2013. This policy framework establishes state-wide WSUD targets for new developments that address water conservation, runoff quality and quantity, and integrated design. Key commitments in the policy include establishing a framework to adopt WSUD in state infrastructure projects; ensuring WSUD is strongly supported through the state's land use planning system; and establishing a WSUD capacity building program to ensure WSUD is implemented in the most appropriate way.

⁴⁶ Bureau of Meteorology, 2015

⁴⁷ The Climate Group, 2015

Managing bushfire risk

To ensure community resilience and preparedness for the impacts of bushfires, the government is developing a series of community workshops on fire management planning and practices, to be targeted at small bushblock land holders. Investigations will also be undertaken on the development of enhanced, fire-specific climate change projections. A scientific forum on fire management under climate change will be held in 2016 that will bring together fire science and climate change science researchers. This will provide an opportunity for information sharing and discussion on interactions between the two disciplines. A series of community meetings will also be held to ensure people understand the research and are prepared to take action with regard to fire and emergency management.

HIGHLIGHTS

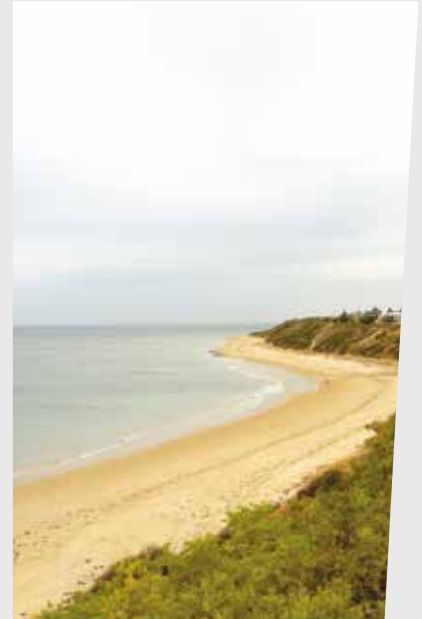
- **Five regions have completed their adaptation plans** – Yorke and Mid North, Eyre Peninsula, Southern Adelaide, Murray Darling Basin and Barossa – with the remaining seven regions on track to deliver their plans in 2016. The key issues highlighted in more than one region include biodiversity management; water resources management; industry adaptation; vulnerable citizens; community services; and planning, development and infrastructure, including green infrastructure and coastal management.
- ‘Preparing for climate change’ is one of four priorities in the *State Public Health Plan South Australia – a Better Place to Live*⁴⁸. Guided by the Public Health Plan, local councils are addressing the climate change priority in their **Regional Public Health Plans**. Some councils are working in regional partnerships to develop climate change adaptation plans, while others are working independently to develop responses ranging from heat stress management to emergency management plans for their regions.
- The National Climate Change Adaptation Research Facility’s (NCCARF) **Vulnerable Communities Network** (VCN) is hosted by the School of Public Health at the University of Adelaide. The VCN is a community of researchers, decision-makers, advocacy groups and community service organisations. The network facilitates research capacity, promotes adaptation tools for use in the community services sector through the Australian Council of Social Service (ACOSS); provides decision-makers with synthesised research reports in accessible formats; and raises awareness about the impacts on vulnerable populations.
- The **Science to Solutions** Project is a partnership between the Local Government Association of South Australia (LGA) and DEWNR. Science to Solutions aims to develop tools and strategies to improve adaptation planning. The first stage of the project, to understand institutional, policy or information barriers to climate adaptation integration in strategic and operation planning processes, was finalised in July 2014. In April 2015, the LGA and DEWNR agreed on a work program for stage two, which will consist of projects to support implementation of existing adaptation actions; integrate climate risk considerations into strategic documents; and deliver targeted training to decision-makers.
- **Sector agreements** under section 16 of the *Climate Change and Greenhouse Emissions Reduction Act 2007* are used to underpin regional climate change adaptation planning by bringing together key partners in a formal collaborative agreement. To date, five regions have entered into sector agreements with the government – Eyre Peninsula, Yorke and Mid North, Barossa, Southern Adelaide Metro and Western Adelaide Metro – with adaptation to the impacts of climate change as a key focus. This collaborative approach was recognised through the Climate Group’s Policy Innovation Briefing launched at New York Climate Week in 2015.
- Early in 2015, the Eyre Peninsula Natural Resources Management Board released its newest grant pool, the **Adapt NRM Grant Program**, to support local government, regional bodies and industry associations undertake projects that promote the sustainable management of natural resources and progress priority adaptation options outlined in the Regional Climate Change Adaptation Plan for the Eyre Peninsula. In 2015/16, six projects will be funded covering the topics of flood mitigation, reclaimed water irrigation, soil management, threatened species, biodiversity and the oyster industry.

⁴⁸ SA Health, 2013

THEME 5: CASE STUDIES

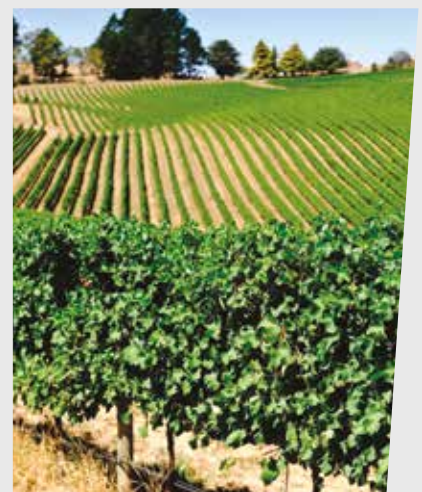
12. MALLALA SETTLEMENT COASTAL ASSESSMENT

The University of South Australia was commissioned by the District Council of Mallala to undertake work on a Coastal Settlements Adaptation Study in May 2013. The prime focus of the study was to evaluate how rising sea levels will impact on the settlements of Parham, Webb Beach, Thompson Beach and Middle Beach and to propose adaptation strategies to cope with these changes. Realistic, cost-effective and risk-based recommendations have been provided for proposed adaptation strategies to strengthen the resilience of the four settlements. These are assisting Council with short and long term planning, which is being undertaken in consultation with affected communities. An important priority action is to develop Community Emergency Management Plans in all four communities including accommodation strategies, preparations for sea flood inundation, minimising damage to property, and managing risks to the safety and wellbeing of visitors and residents in each settlement.



13. SARDI⁴⁹ WORKING WITH PRIMARY INDUSTRIES TO MANAGE CLIMATE IMPACTS

Agriculture in South Australia is vulnerable to changes in climate. Low rainfall farmers are concerned about shifts in Goyder's Line of reliable cropping. However changes in farming practices and crop varieties have been shown to counter some of the pressure. Wine grape growers have noticed warmer vintages upsetting fruit and wine balance, and "compressing" harvest into shorter time windows. SARDI, the research arm of PIRSA, is exploring cost-effective practices to counteract these effects. Preliminary studies with Barossa Shiraz show that delaying pruning from winter into early spring improves wine balance and spreads harvest. Although climate change presents considerable challenges, there is a high level of adaptive capacity in agricultural industries that comes from a partnership between local know-how and applied research.





THEME 6 BUILDING COMMUNITY CAPACITY TO TAKE ACTION ON CLIMATE CHANGE

COMMUNITY-LED ACTION CAN OFTEN TACKLE CHALLENGES MORE EFFECTIVELY THAN ACTION BY GOVERNMENT ALONE

South Australians are already taking action to use energy more efficiently, conserve water resources, take public transport more often and reduce waste by recycling and reusing. Actions by individuals, community groups, businesses and schools to reduce emissions or put in place adaptive measures can be powerful drivers for change by influencing other people to take action. Community-led action can often tackle challenges more effectively than government alone by developing solutions that meet local needs and involve local people.

A wide range of community organisations in South Australia are already active and engaged in promoting action at the local level. Schools are often a focal point for local communities and therefore have an important role to play in raising awareness about the issues.

The education and training sector has an important role in supporting community action by ensuring people have relevant training and skills to help them navigate the transition to a low carbon economy.

A strong message that arose from the community consultation process was the need for people to be given clear and accessible information about what climate change means for them, and what they can do about it, both in terms of adopting more sustainable lifestyles and taking action to adapt to the impacts. The Premier's Climate Change Council highlighted in their 2050 Vision, the need to engage with community, industry, business and government sectors to build a shared understanding and commitment to action.

State and local governments have an important role, working in partnership with industry and community service organisations, to provide up-to-date, relevant and accessible information to different groups in our community so they understand what the issues are and are able to make appropriate and affordable choices.

Some sections of the community will be particularly vulnerable to the impacts of climate change, including the elderly and the very young, people living in remote and vulnerable coastal areas and low income households. Government has a responsibility to prioritise support for these groups by working with the community services sector to build capacity to provide assistance.



NEW INITIATIVES

The following new initiatives will help to build community capacity to take action on climate change. Additional actions will be developed in consultation with key sectors and the community.

Introducing a carbon neutral community challenge

The Carbon Neutral Adelaide Challenge will invite people from South Australia and across the world to design and create innovative solutions to make the City of Adelaide the world's first carbon neutral city. The Challenge encourages partnerships between South Australians and international communities including businesses and entrepreneurs. The Challenge will spark new ideas for smart enterprise in a low carbon economy through the use of open data, innovative design, policy ideation and community action. By engaging industry, the private sector and the community in activities that help achieve carbon neutrality, the Challenge will make a significant contribution to a low carbon future for Adelaide.

Facilitating behaviour change

Building on existing climate change communications and behaviour change programs, and in consultation with community organisations and councils, the government will develop a targeted communication and behaviour change program that will provide comprehensive information, support and advice to help people understand the implications of the net zero emissions target and empower them to take effective action. The information will be targeted at different groups in the community including households, schools, businesses and community organisations. It is vital to ensure that young people, representing the next generation, are engaged in climate change matters. It is also critical that vulnerable members of the community are empowered to take action. To this end, youth and vulnerable citizens will be a focus for engagement. The government will also embed the net zero emissions target

in a broad range of government communications covering issues such as tourism, health, education, transport, water use, emergency management and primary industries.

Introducing a Premier's Climate Change Council award

The Premier's Climate Change Council will introduce an award program that recognises the achievements of individuals, communities, government and industry. The program will acknowledge achievements in the areas of reducing emissions, adapting to climate change and raising awareness about the issues and what can be done to address them.

HIGHLIGHTS

- The government has provided the **Conservation Council of South Australia (CCSA)** with a grant to help increase community engagement and understanding of the impact that climate change will have on people's lives and raise awareness about what South Australians can do to reduce their emissions and adapt to a changing climate. The CCSA will undertake or facilitate a range of activities including exploring community-owned renewable energy schemes; a public art project in the CBD; developing a Roadmap for Energy Transition with unions and industry; and organising a series of expert speaker seminars. The CCSA has already organised a Future Transport Workshop and Festival to explore ideas for sustainable transport options.
- **Regional climate change adaptation planning projects** are engaging community leaders across South Australia in climate change planning. For example, in July 2014, the Resilient South Regional Climate Change Adaptation Plan was released. This was the outcome of a partnership between the Cities of Onkaparinga, Holdfast Bay, Marion and Mitcham. Partners took an innovative



approach to adaptation planning and stakeholder engagement by incorporating social sciences with climate science, and closely collaborating with 'Project Champions' representing the government, community, health, business, education, research and natural resources management sectors. Resilient South won the 2014 NCCARF Climate Adaptation Champion in the local government category.

- The **Energy Partners Program** is working with over 90 organisations across the social, environmental, local and state government sectors to help South Australian households manage their energy use and costs, and improve their energy efficiency. Established in 2011, the program provides access to energy expertise and advice, creates online and printed resources, shares information, promotes relevant government services, offers home energy audit toolkits, and facilitates energy training for staff and volunteers. By empowering a large network of community-based organisations, the Energy Partners Program reaches a large number of people and can target information and support to where it is needed most.
- **Housing SA** is investing \$5.5 million to replace 1000 LPG gas and electric hot water systems in larger family homes with energy efficiency solar hot water systems. These systems will help families save energy and reduce costs and greenhouse gas emissions.
- The **Adelaide Hills Wine Region** is undertaking a case study project to understand the extent to which improved water management during a heatwave can mitigate damage to grape yield and wine quality. The project involves engaging with the regional wine industry, as well as the regional apple, pear and cherry sectors, which may also benefit from the results. These sectors make a significant contribution to South Australia's economy and exports by producing high-value, premium product, and are a significant driver for tourism.

THEME 6: CASE STUDIES

14. SCHOOL 'CHAMPIONS' COWANDILLA PRIMARY SCHOOL

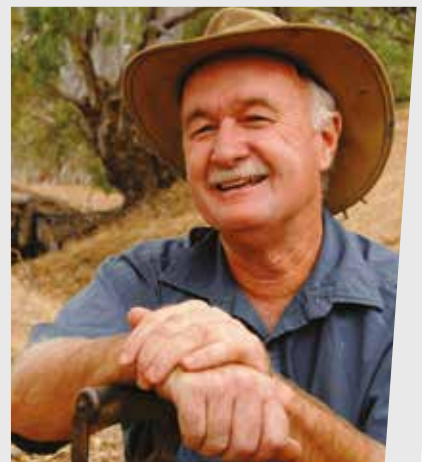
Cowandilla Primary School is a near city school with a highly diverse student population. Cowandilla has been a Climate Change Focus School since 2003 and in 2015 won a Specialist Schools Grant to progress work on climate change. The students were keen to form a Climate Change Student Group after being taught about climate change at the time the 2006 documentary *An Inconvenient Truth* was released. The Climate Change Student Group is a group of volunteers who help with the school's recycling system, planting and caring for a vegie garden and native plants, writing articles for the school newsletter and sharing information at assemblies.

Cowandilla has capacity to catch 400,000 litres of rainwater, which is used to flush toilets and partly irrigate the gardens and oval. Exotic trees have been replaced with natives, and lawn has been removed where it was not needed as a playing surface. Solar panels have been installed and programs introduced to reduce electricity and water consumption. By visiting Christie Walk⁵⁰, the Food Forest⁵¹, the market and the zoo, students are taught about sustainable house design, local food production, food miles and the interconnectedness of ecosystems on Earth.



15. COMMUNITY 'CHAMPIONS' BRIAN FOSTER

Brian is recognised as a leader in rural and regional adaptation to climate change, driven by first-hand experience and understanding as a fourth generation farmer on the Eyre Peninsula. Brian's commitment to addressing the challenges of climate change began in the late 1990s; his attendance at a lecture by Professor Tim Flannery in Port Lincoln in 2005 strengthened this commitment. Brian was instrumental in ensuring climate change was incorporated into the Eyre Peninsula Natural Resource Management Plan – one of the first Natural Resources Management Plans in Australia to formally incorporate climate change. Brian played a key role in establishing the Eyre Peninsula Regional Sector Agreement, the first of its kind in Australia. In June 2013, Brian won the National Climate Change Adaptation Research Facility (NCCARF) National Climate Champion Individual Award. Brian is a member of the Premier's Climate Change Council.



⁵⁰ <http://www.urbanecology.org.au/eco-cities/christie-walk/>

⁵¹ <http://www.foodforest.com.au>

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GLOSSARY



BATTERY STORAGE

An electrical device that has capability to store generated electricity from a variety of generating sources including solar and wind.

BIO-ENERGY

Biofuel or bioenergy is any fuel that is derived from biomass—recently living organisms or their metabolic byproducts. Examples include methane from manure and ethanol fuel sourced from plants. It is a renewable energy source, unlike other natural resources such as petroleum, coal and nuclear fuels.

CARBON DIOXIDE EQUIVALENT (CO₂E)

An internationally accepted measure that encapsulates all of the different greenhouse gases. Each of the gases has a different 'global warming potential' in terms of an equivalent amount of carbon dioxide (the major greenhouse gas). Methane, for example, has a global warming potential 21 times that of carbon dioxide—so one tonne of methane is equivalent to 21 tonnes of CO₂-e.

CARBON NEUTRAL

Net greenhouse gas emissions are zero. This can be achieved by preventing or offsetting emissions (e.g. by supporting a tree planting scheme that will absorb carbon dioxide), or a combination of the two.

CARBON PRICING

A system where a monetary charge is applied to the right to emit a unit of carbon. The carbon price can be determined by a regulator or the open market via the trading of permits.

CLEAN TECH

A description relating to products, services and processes that can optimise operational performance and productivity, reduce the necessity for natural resource exploitation and cut or eliminate emissions and wastes.

CLIMATE CHANGE ADAPTATION

Actions by individuals or systems to avoid, withstand or take advantage of current and projected climate changes and impacts. Adaptation decreases a system's vulnerability or increases its resilience to impacts.

CLIMATE CHANGE AND GREENHOUSE EMISSIONS REDUCTION ACT 2007

South Australian legislation to provide for measures to address climate change by setting targets to achieve a reduction in greenhouse gas emissions within the state; to promote the use of renewable sources of energy; to promote business and community understanding about issues surrounding climate change; and to facilitate the development of policies and programs to address climate change.

CLIMATE CHANGE PROJECTIONS

A forecast of expected climatic changes into the future based on scientific modelling and greenhouse gas emissions scenarios.

EMISSIONS REDUCTION TARGET

A measurable target to reduce the amount of greenhouse gas emissions released.

ENERGY EFFICIENCY

The ratio of energy required to produce a certain level of a service such as kilowatt per unit of heat or light.

FEED-IN TARIFF

A payment made to households or businesses that generate their own electricity through means such as solar photovoltaic panels.

GREENHOUSE GAS EMISSIONS

The release of greenhouse gases into the atmosphere. A greenhouse gas is an atmospheric gas that absorbs and emits infrared or heat radiation, giving rise to the greenhouse effect. Typical greenhouse gases include carbon dioxide, methane, nitrous oxide and refrigerants.

GROSS DOMESTIC PRODUCT (GDP)

The total value of goods produced and services provided in a country during one year. Gross State Product (GSP) is the state equivalent.

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

The scientific intergovernmental body under the auspices of the United Nations, established in 1988 by the World Meteorological Organisation (WMO) and the United Nations Environment Program (UNEP) at the request of member governments. The IPCC produces reports that support the United Nations Framework Convention on Climate Change (UNFCCC).

LOW CARBON ECONOMY

An economy based on low carbon power sources that has a minimal output of greenhouse gas emissions.

MEGATONNE (MT)

A unit of measurement, expressed as a million tonnes.

MEGAWATT (MW)

A unit of electricity equal to one million watts, particularly used as a measure of the output of a power station.

RENEWABLE ENERGY

Energy that comes from resources which are naturally replenished on a human timescale such as sunlight, wind, rain, tides, waves, and geothermal heat.

RENEWABLE ENERGY TARGET

A policy which seeks to increase the amount of electricity generated from renewable energy sources such as solar, wind, wave and geothermal.

THE CLIMATE GROUP STATES AND REGIONS ALLIANCE

The Climate Group States and Regions Alliance brings together sub-national government leaders from around the world in a powerful, high-profile network that shares expertise, demonstrates impact and influences the international climate dialogue.

UNDER2MOU

The Subnational Global Climate Leadership Memorandum of Understanding is known as the Under 2 MOU in reference to:

- The goal of limiting warming to below 2°C, which Intergovernmental Panel on Climate Change (IPCC) scientists say is needed to avoid dangerous climate change.
- The MOU's shared goal of limiting greenhouse gas emissions to 2 tonnes per capita, or 80-95 per cent below 1990 levels by 2050.



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